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(54) **MULTI-FUNCTION BINDING SYSTEM**

(56)

**References Cited**

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15, 2004, provisional application No. 60/348,274,  
filed on Jan. 15, 2002, provisional application No.  
60/268,542, filed on Feb. 15, 2001, provisional appli-  
cation No. 60/268,541, filed on Feb. 15, 2001.

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**280/624, 626, 629, 14.22, 14.24, 613, 620,**  
**280/625**

See application file for complete search history.

**U.S. PATENT DOCUMENTS**

|           |     |         |                          |
|-----------|-----|---------|--------------------------|
| 3,061,325 | A   | 10/1962 | Glass                    |
| 3,944,237 | A   | 3/1976  | Teague, Jr.              |
| 4,163,569 | A   | 8/1979  | Horn                     |
| 4,290,213 | A   | 9/1981  | Salomon                  |
| 4,505,493 | A   | 3/1985  | Gustavsson               |
| 4,923,207 | A   | 5/1990  | Pozzobon                 |
| 5,499,837 | A * | 3/1996  | Hale et al. .... 280/607 |

(Continued)

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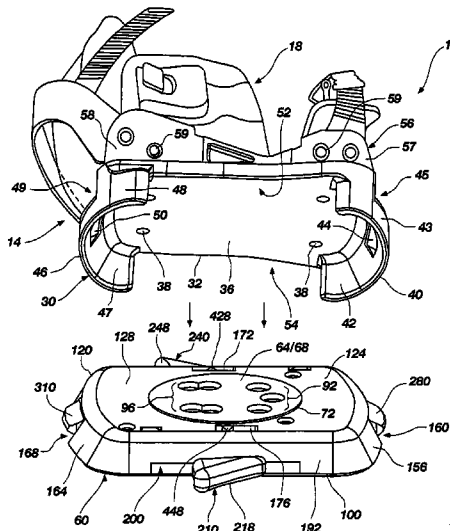
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**ABSTRACT**

A multi-function binding system configured for use on a sliding board comprising: (a) a binding operable with a boot assembly, the binding comprising a support surface and toe and heel pieces; (b) a base assembly rotatably and removably secured to a deck of a sliding board and to releasably couple the binding, the base assembly comprising: (i) a support disc removably coupled to the deck of the sliding board and to secure the base assembly to the sliding board; (ii) a deck plate rotatable about the support disc and configured to be positioned adjacent the deck; (iii) a bonnet also rotatable about the support disc and configured to receive and engage the binding; (iv) an adjustment mechanism for rotational adjustment of the bonnet and the deck plate about the support disc with respect to the sliding board; (v) a coupler mechanism configured to releasably couple the binding to the base assembly, and therefore the boot system to the sliding board, thereby securing a user thereto; and (vi) a release for actuating the coupler to release the binding from the base assembly, and therefore the the boot system from the sliding board.

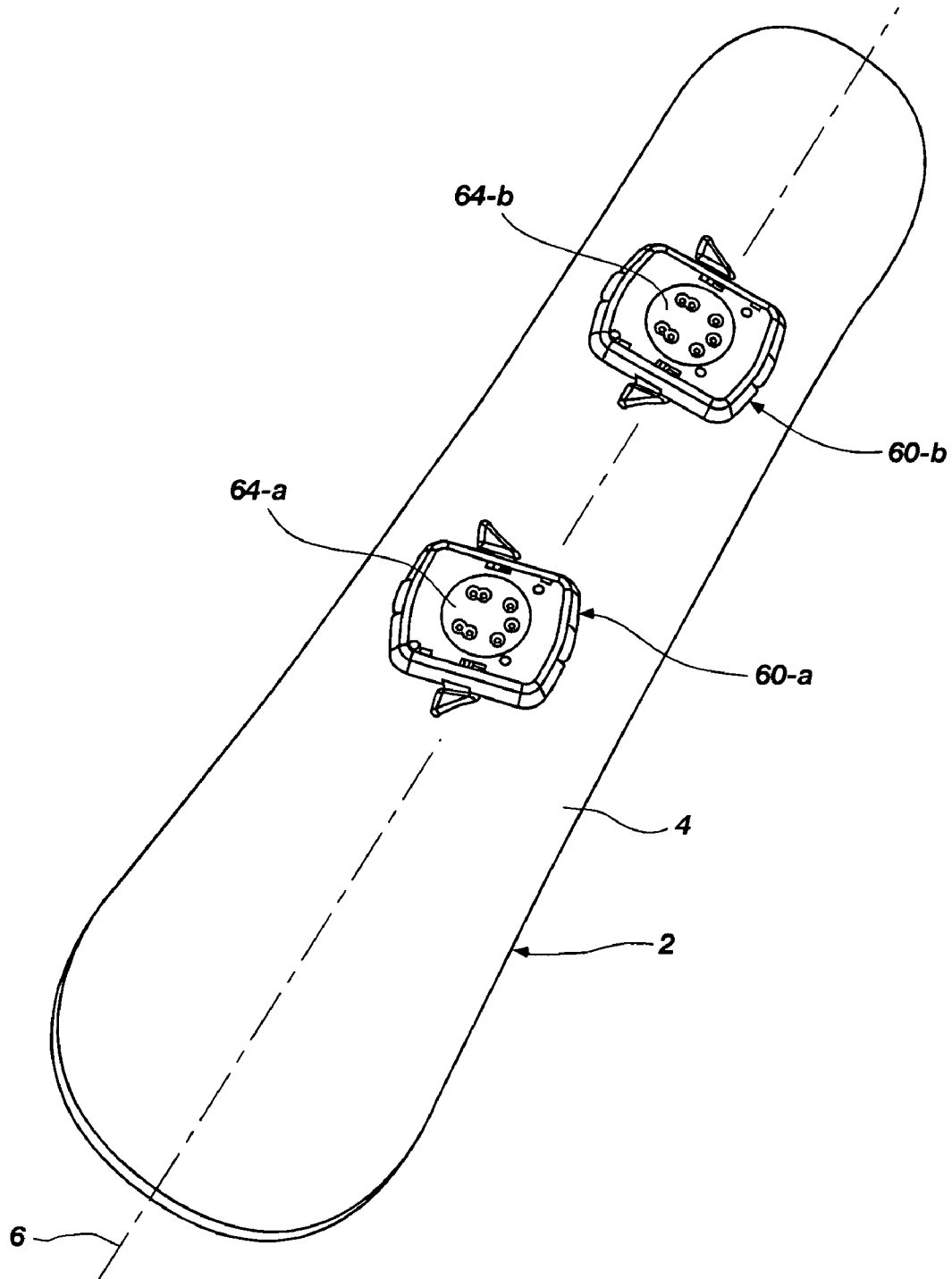
**27 Claims, 12 Drawing Sheets**



# US 7,267,357 B2

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| U.S. PATENT DOCUMENTS |     |         |                 |         |                     |      |         |                    |           |
|-----------------------|-----|---------|-----------------|---------|---------------------|------|---------|--------------------|-----------|
|                       |     |         |                 |         | 6,257,613           | B1   | 7/2001  | Porte              |           |
|                       |     |         |                 |         | 6,338,497           | B1   | 1/2002  | Chevalier et al.   |           |
| 5,820,155             | A * | 10/1998 | Brisco .....    | 280/607 | 6,428,032           | B1   | 8/2002  | Humbel             |           |
| 5,915,721             | A   | 6/1999  | Laughlin et al. |         | 6,460,865           | B2 * | 10/2002 | Keller et al. .... | 280/14.21 |
| 5,947,508             | A   | 9/1999  | Graf et al.     |         | 6,523,851           | B1 * | 2/2003  | Maravetz .....     | 280/603   |
| 6,062,584             | A * | 5/2000  | Sabol .....     | 280/607 | 6,773,024           | B2 * | 8/2004  | Walkhoff .....     | 280/613   |
| 6,102,430             | A   | 8/2000  | Reynolds        |         | 6,916,036           | B1 * | 7/2005  | Egli .....         | 280/618   |
| 6,182,999             | B1  | 2/2001  | Bourdeau        |         |                     |      |         |                    |           |
| 6,213,493             | B1  | 4/2001  | Korman          |         |                     |      |         |                    |           |
|                       |     |         |                 |         | * cited by examiner |      |         |                    |           |



**Fig. 1**

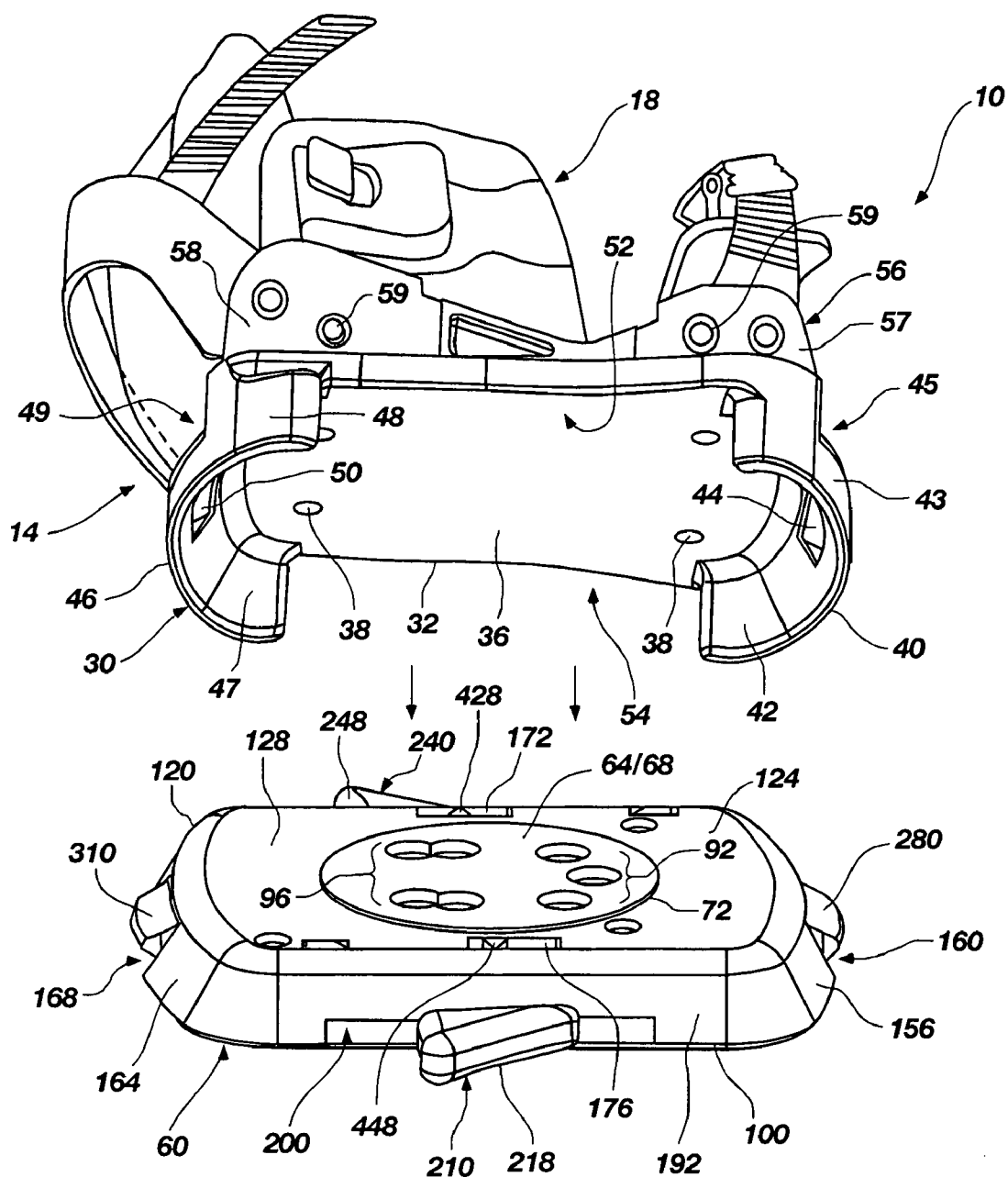
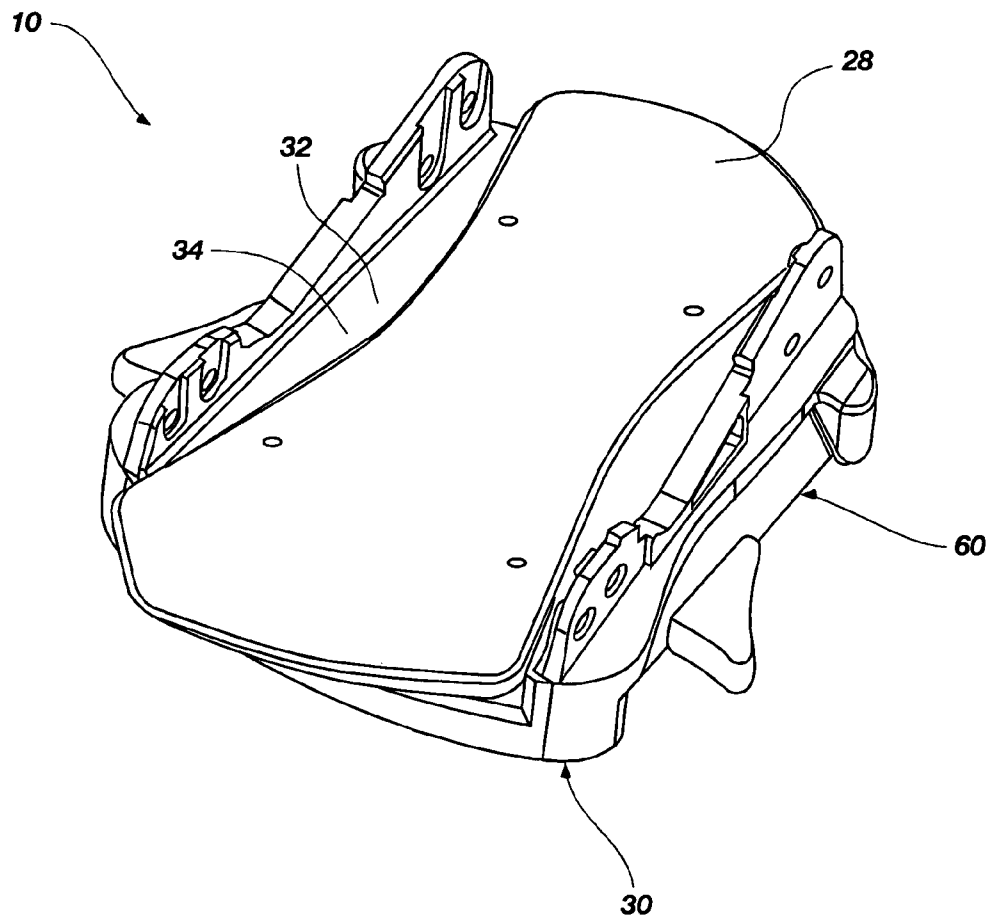


Fig. 2



**Fig. 3**

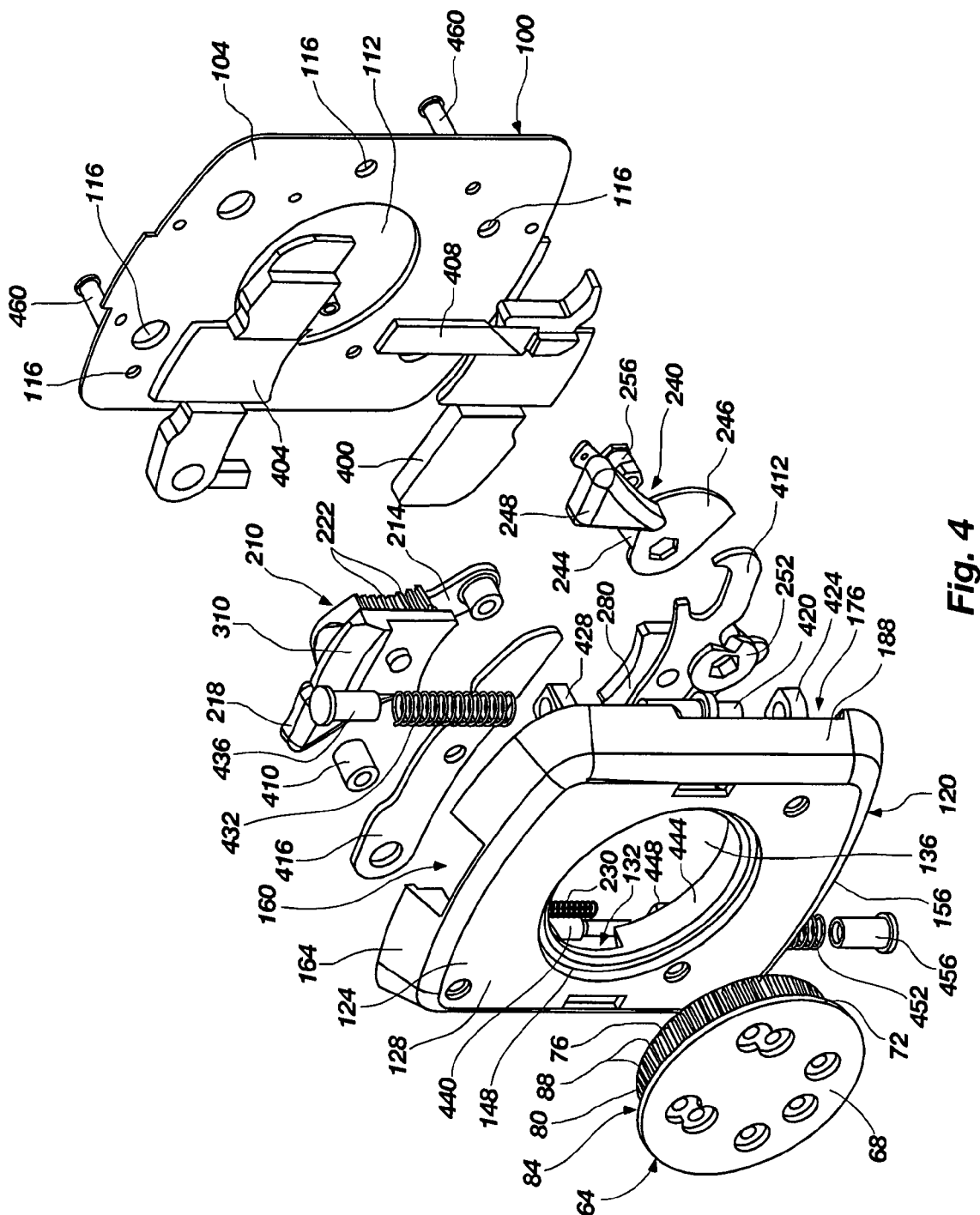


Fig. 4

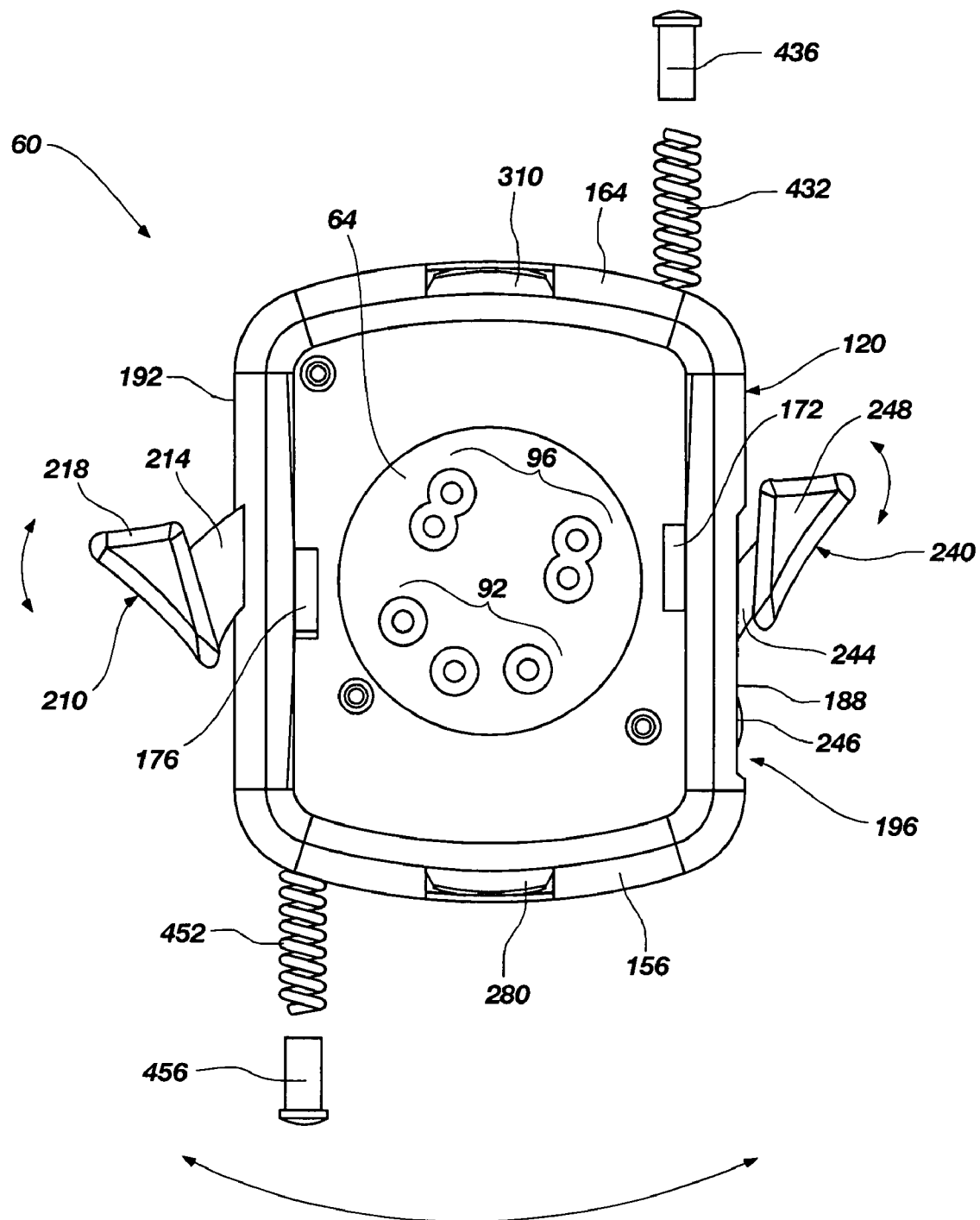


Fig. 5

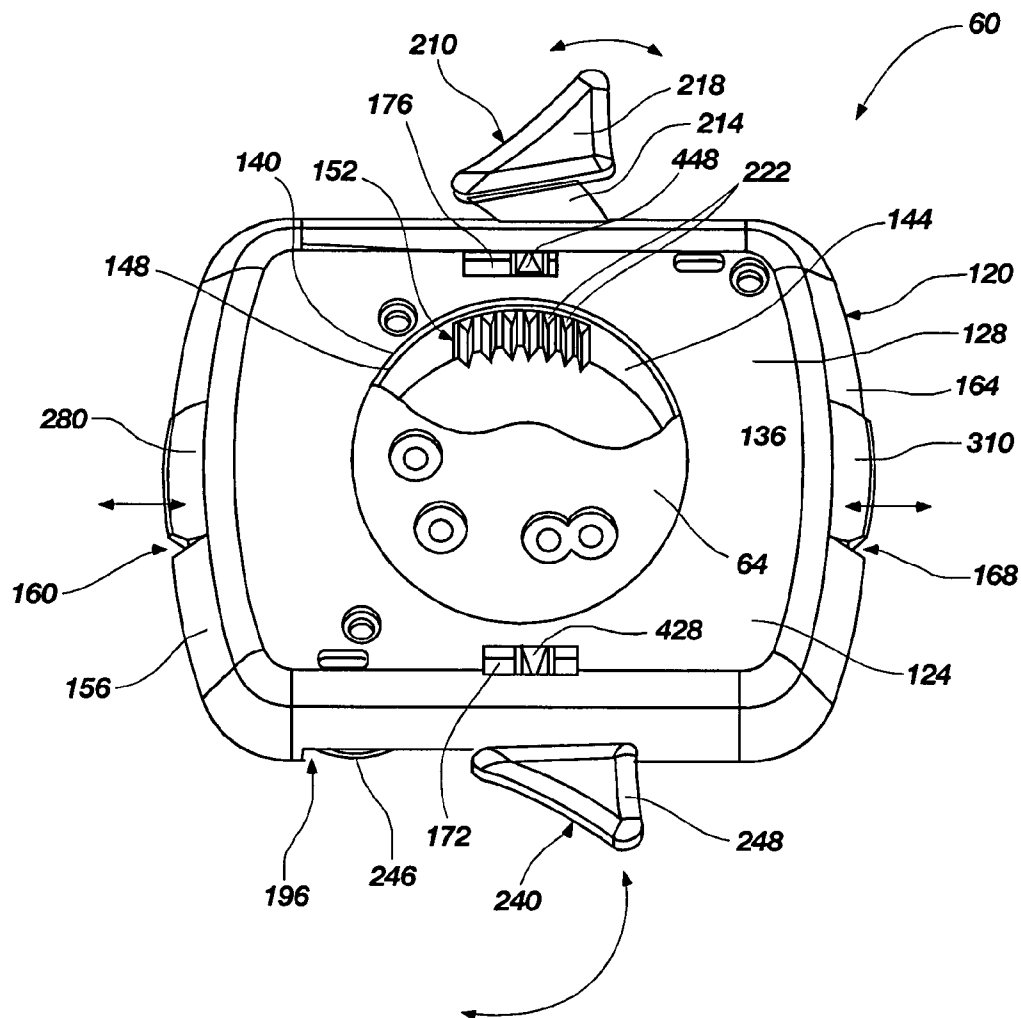


Fig. 6

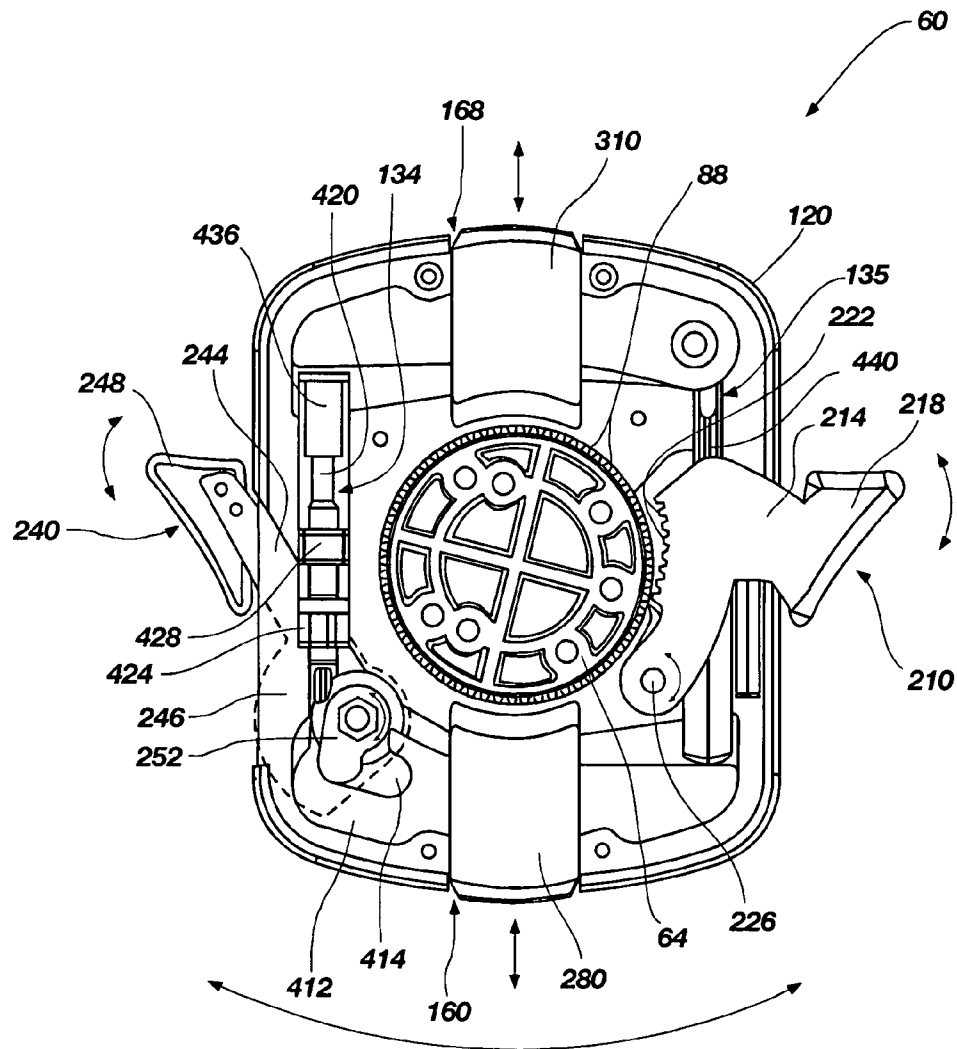


Fig. 7

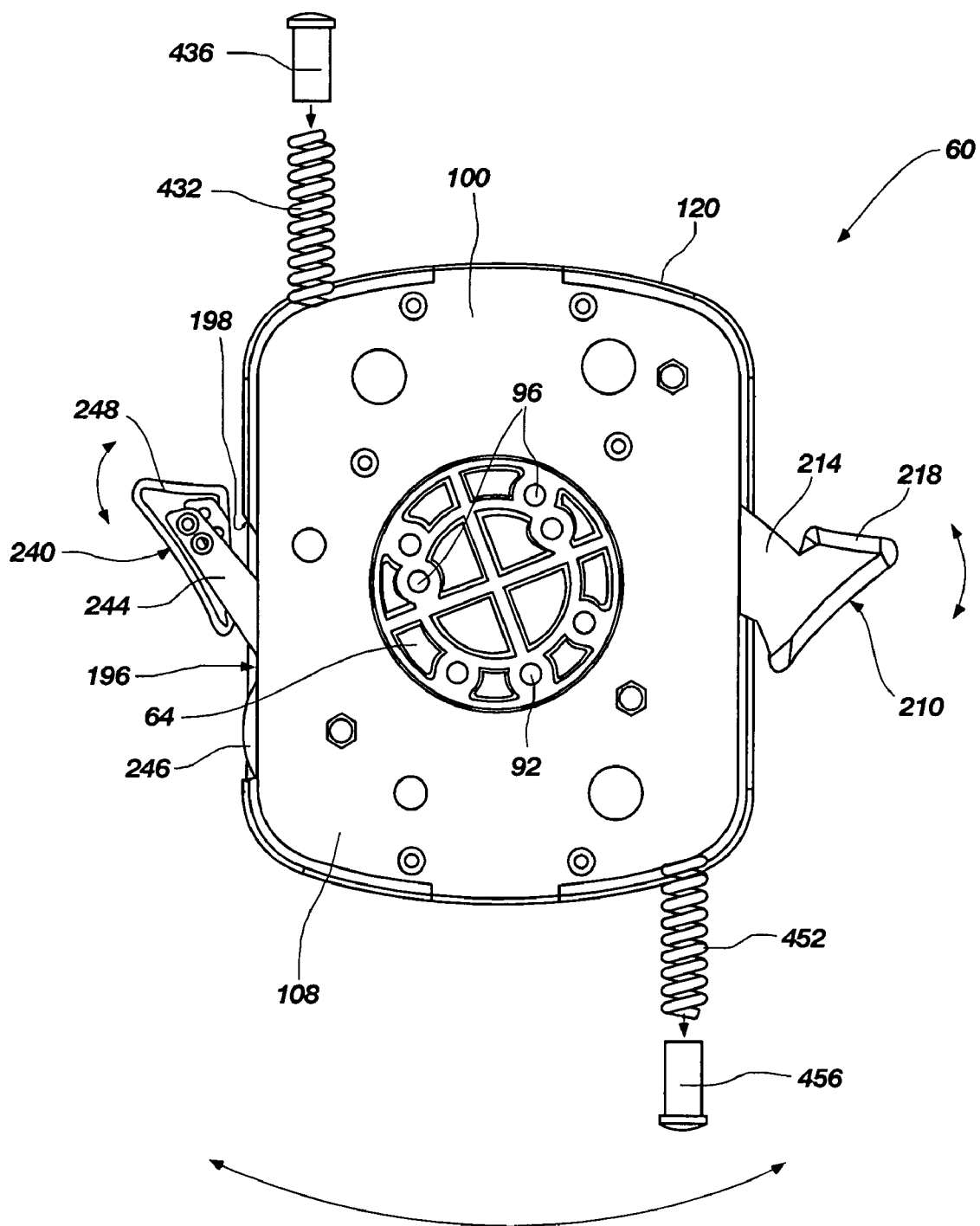
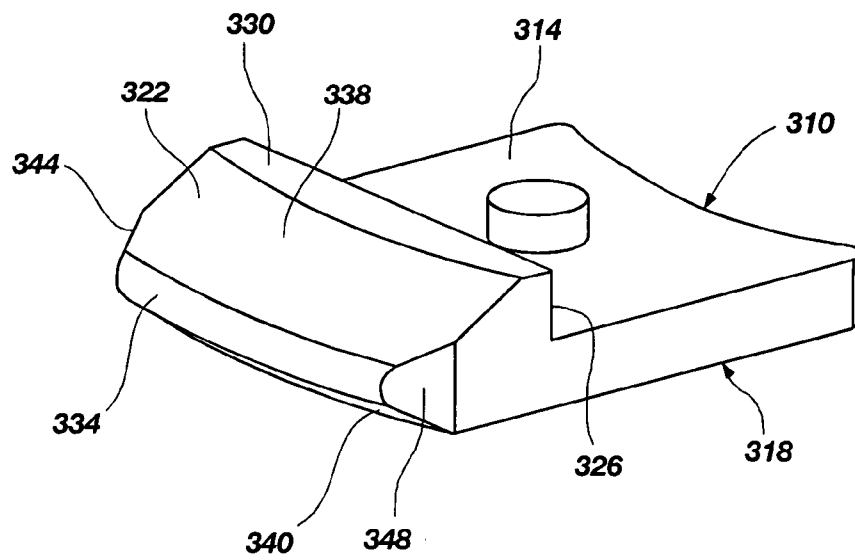
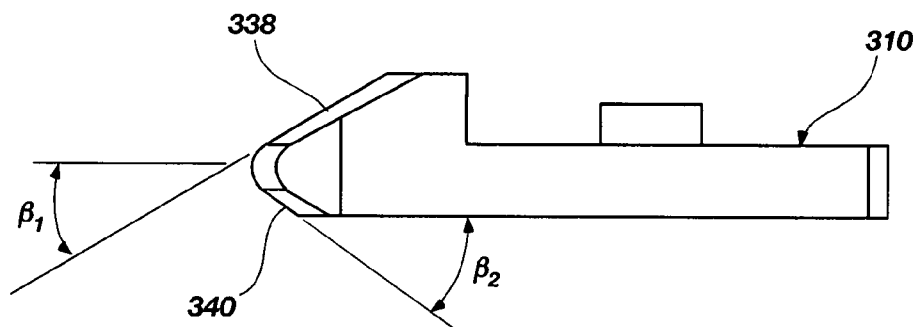


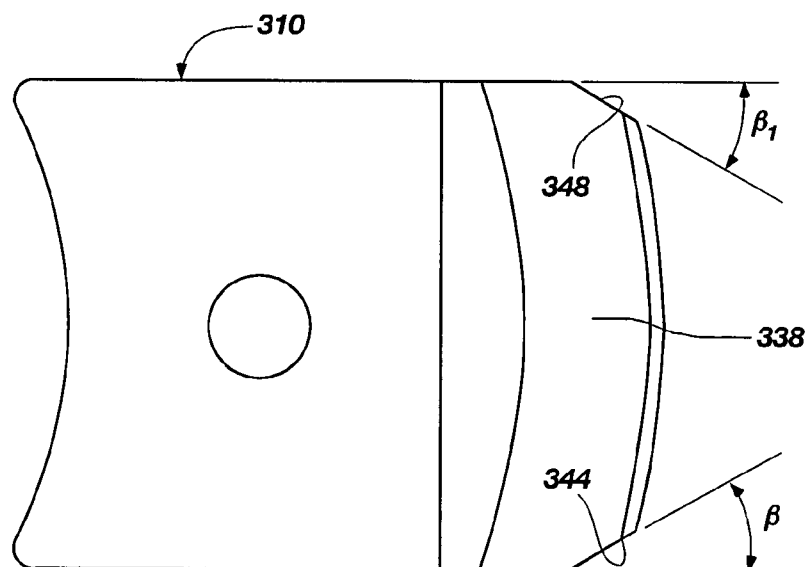
Fig. 8



**Fig. 9-A**



**Fig. 9-B**



**Fig. 9-C**

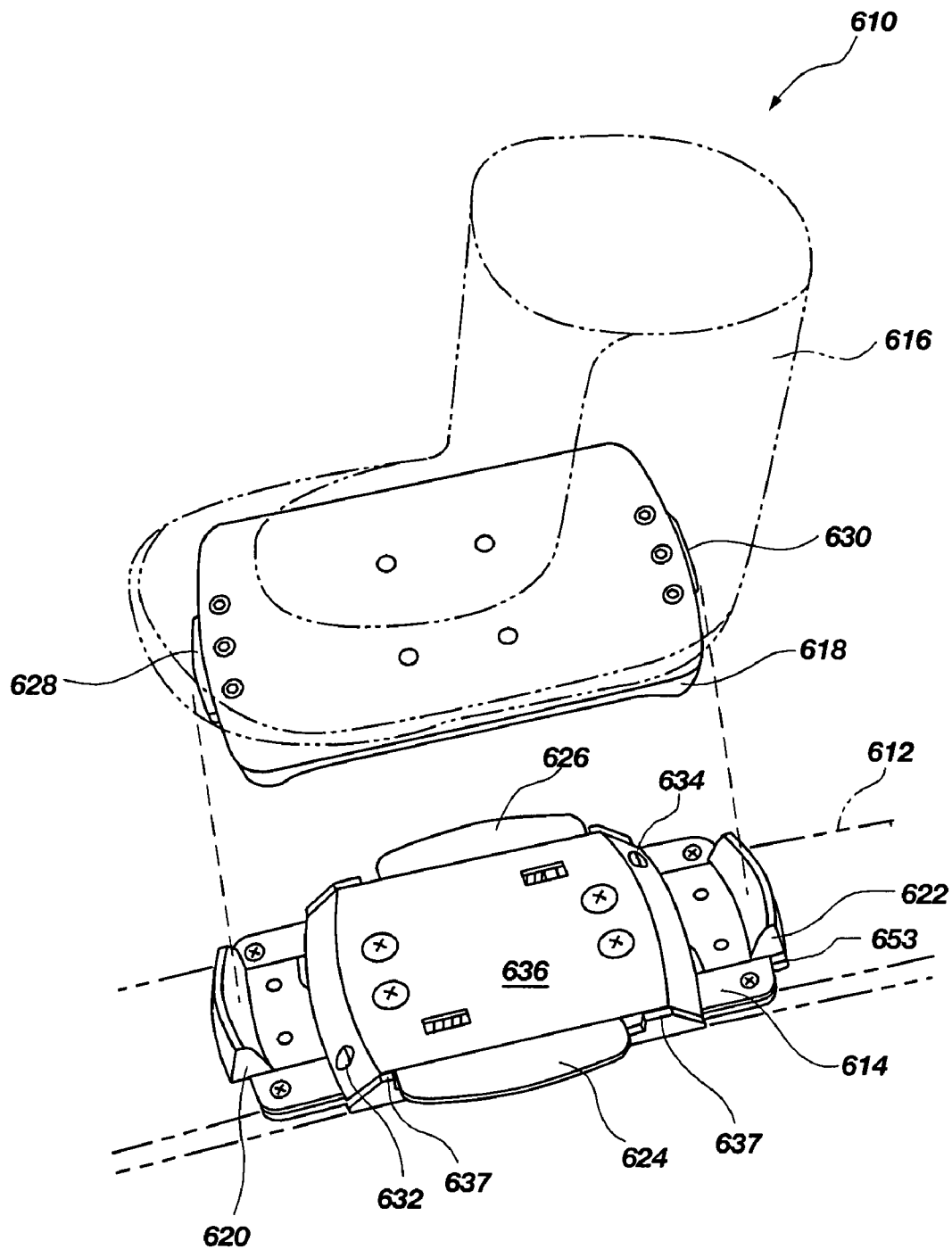


Fig. 10

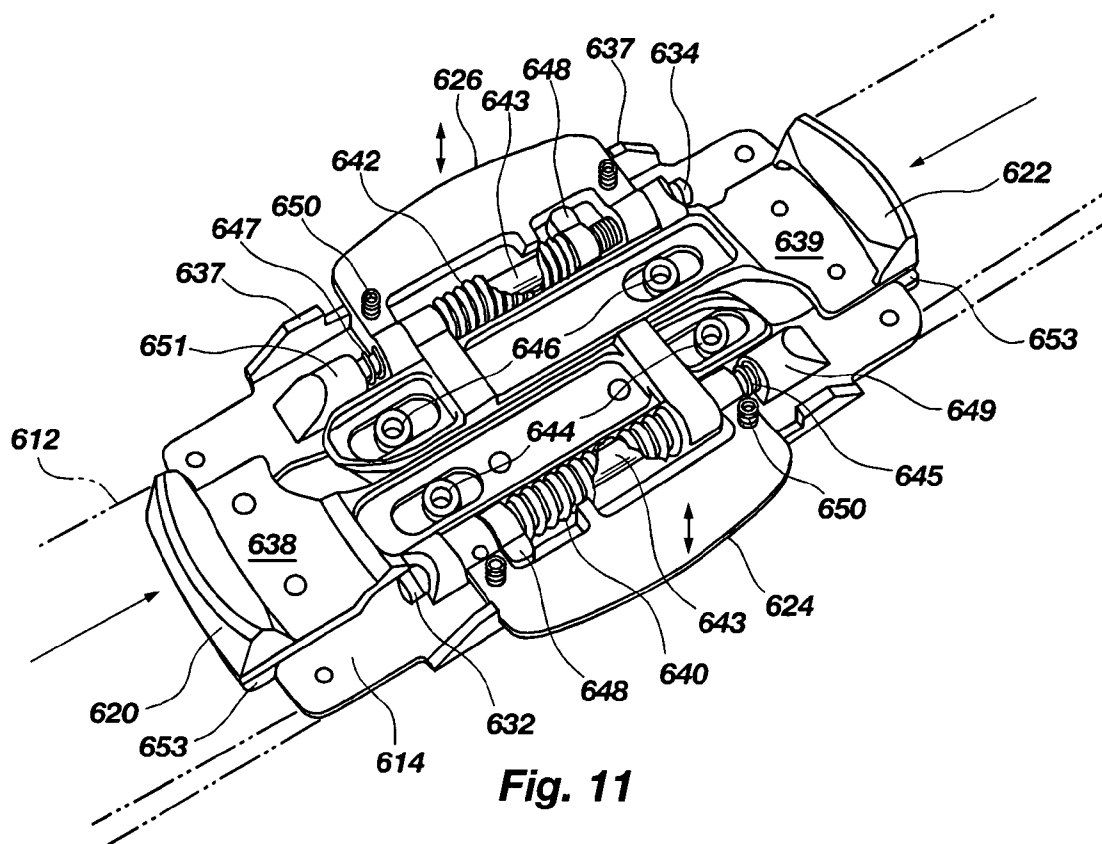


Fig. 11

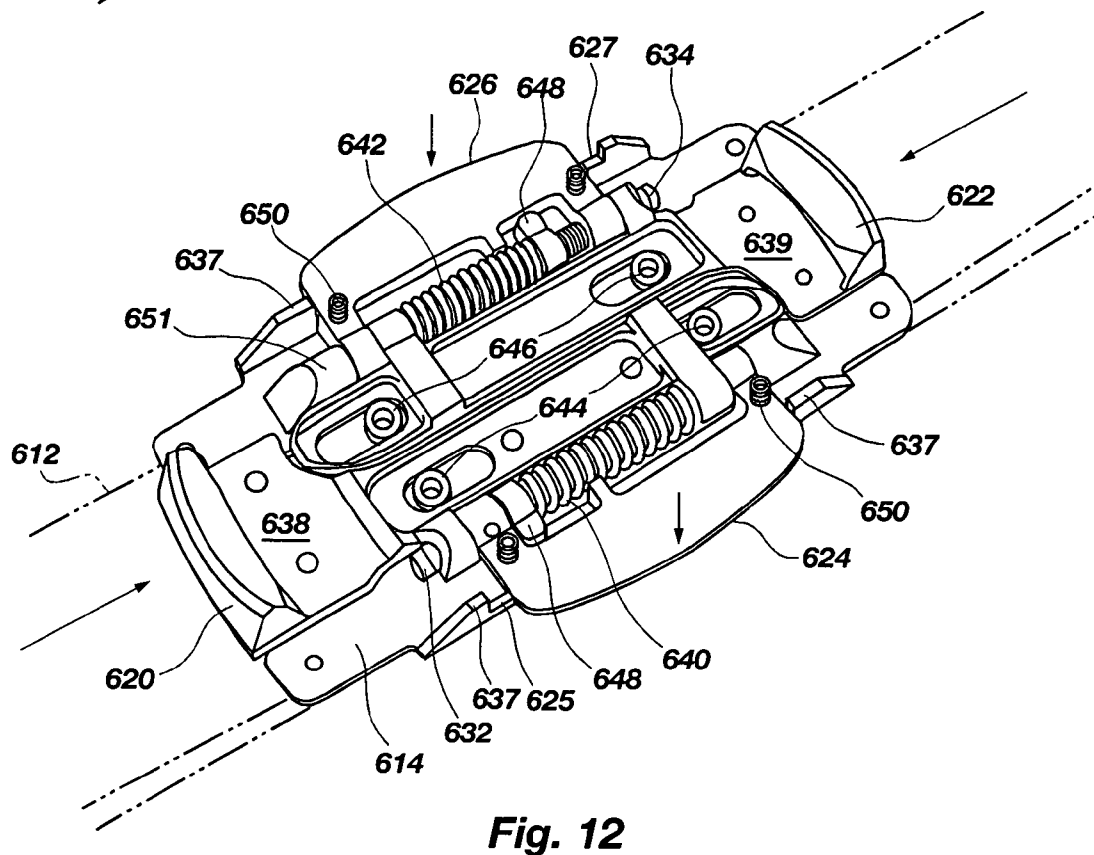


Fig. 12

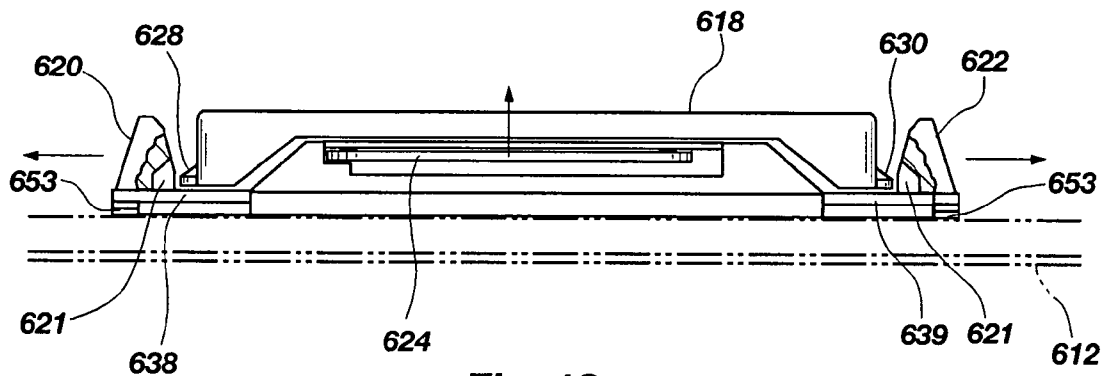


Fig. 13

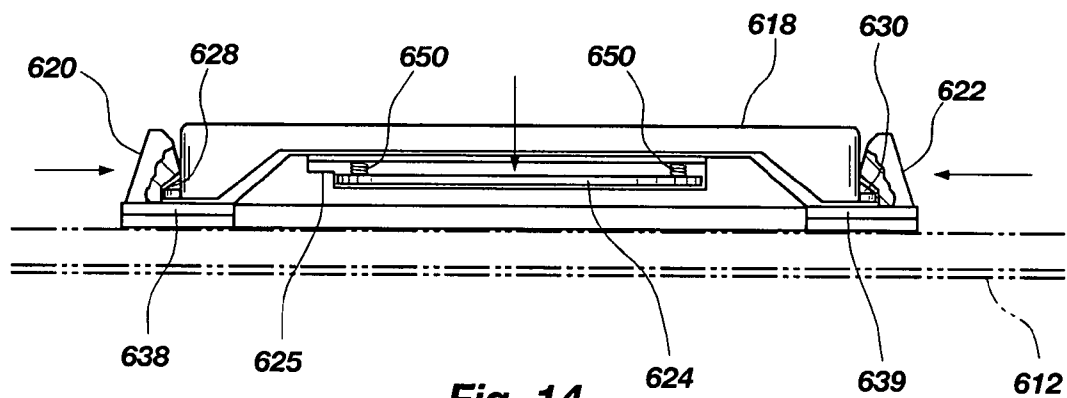


Fig. 14

**MULTI-FUNCTION BINDING SYSTEM****RELATED APPLICATIONS**

This application is a continuation-in-part application that claims priority to U.S. Provisional Application No. 60/579, 526, filed Jun. 15, 2004, and entitled, "EZ multi-function release binding for boards and skis," which is incorporated by reference herein in its entirety. This continuation-in-part application further claims priority to U.S. patent application Ser. No. 10/467,941, filed Aug. 14, 2003 now U.S. Pat. No. 7,178,821, and titled, "Universal Ski and Snowboard Binding," which claims priority to PCT Application No. PCT/US02/05174, filed Feb. 15, 2002, and titled, "Universal Ski and Snowboard Binding," which claims priority to U.S. Provisional Patent Application Nos. 60/268,542, filed Feb. 15, 2001, and titled, "Z Release System;" 60/268,541, filed Feb. 15, 2001, and titled, "Breakaway Interface;" and 60/348,274, filed Jan. 15, 2002, and titled, "Z Combo Release & Conversion System," each of which are incorporated by reference herein in their entirety.

**FIELD OF THE INVENTION**

The present invention relates to bindings configured to secure the foot or feet of a user or rider to a sliding board enabling the user to participate in a sliding sport, such as skiing, snowboarding, wakeboarding, etc. More particularly, the present invention relates to an adjustable tension release binding that is interchangeable, wherein it and or its design may be adapted for use on a plurality of different types of sliding boards, such as water or snow skis, snowboards, water skis, wakeboards and the like.

**BACKGROUND OF THE INVENTION AND RELATED ART**

Snowboarding, skiing, wakeboarding, and similar sliding sports are increasing in popularity as competitive sports and as recreational activities that are being participated in by numerous people. The sliding boards used in these sports or activities, such as snowboards, skis, wakeboards, and other sliding boards, are continually developing, with new technology improving their functionality and performance.

In recent years, snowboarding has gained in popularity and is nearly as popular as skiing. Unfortunately, the safety aspects of snowboarding equipment lag behind that developed for skiing, particularly with respect to the binding systems provided to secure the snowboard to the feet of the rider. The form of snowboard binding which is currently most broadly used includes two bindings fastened to the snowboard, each binding having a plurality of straps adapted to fasten around a respective boot of the rider. In use, the rider places his or her boot clad feet on the bindings and tightens the straps around the boots to secure the board to the rider's legs. In order to remove the board, the rider must manually and individually unfasten each of the straps to release the snowboard bindings from the rider's boots. Other types of fasteners and bindings are also available, which include plate bindings and step-in bindings.

It is known that the majority of snowboarding fatalities have resulted from suffocation in deep snow. With the snowboard unreleased and still attached to the rider's feet, the length of the snowboard can act as an anchor in the event of a snow slide or avalanche, and once covered in snow the rider may not be able to reach the binding straps in order to remove the board. It may therefore be desirable for a

snowboard binding to enable the rider's legs to be released from attachment to the board in the event the snowboard is subjected to abnormal forces, such as may occur in the case of a severe fall or an avalanche.

Another difficulty associated with snowboard bindings occurs where the rider wishes to use a ski lift or tow to return to the top of a mountain slope. In order to negotiate lift lines and mount a lift chair, the rider must generally free one foot from the board to facilitate maneuvering into position. Once exiting the lift chair, the free boot must then be re-fastened within the free binding on the snowboard. This constant cycle of unfastening and re-fastening the conventional binding is both physically exhausting and time consuming, and it would therefore be desirable for an improved snowboard binding to enable easier securing and releasing of at least one boot from the board when desired.

Ski bindings are traditionally designed to release the ski from the ski boot if abnormal forces are present between the ski boot and ski binding, so that those forces are not transmitted to the skier's leg where they may cause injury. However, in order to provide adequate and safe release, or tension release, complex mechanisms are employed within the ski bindings. These complex mechanisms typically provide only a limited number of release angles, thus increasing the potential that an impact or other force will not trigger a justified release. Despite their deficiencies, it would be advantageous for snowboard bindings to have a similar tension release mechanism, such that the likelihood of injury is decreased in the event of a severe fall, particularly one in which the body or legs of the snowboarder twist relative to the board.

Another problem with prior related bindings is that there is no interchangeability between the types of sliding boards, thus increasing the expense of participating in more than one sliding sport. Indeed, individuals often like to snowboard, wakeboard, etc. as well as to ski. For example, an individual may want to ski in the morning using alpine skis but later ski in the afternoon on a snowboard. In order to do so, the individual would have to change the type of boots being worn in order to use the alpine skis or the snowboard. Accordingly, it would be a great benefit to provide a universal binding that would be as efficient and applicable for alpine skis as it is for snowboards. Further, this universal binding should also be adaptable to other sliding boards, including, but not limited to water skis, wakeboards, and others.

**SUMMARY OF THE INVENTION**

In light of the problems and deficiencies inherent in prior related bindings, the present invention seeks to overcome these by providing a binding system having several functional aspects. Indeed, riders of sliding boards, such as snowboards and skis, require some binding means configured to secure or otherwise releasably affix their feet to the sliding board. In addition, it is desirable to have other features, such as variable and user-adjustable tension release, infinite release angles, variable and user-adjustable stance orientations, and the ability to use a single binding or a single binding design on many different types of sliding boards. Each of these are provided for in the present invention binding system.

More particularly, and in accordance with the invention as embodied and broadly described herein, the present invention features a binding system configured for use on a sliding board comprising: (a) a binding operable with a boot assembly, the binding comprising a support surface and toe and

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heel pieces extending therefrom; (b) a base assembly configured to be rotatably and removably secured to a deck of a sliding board and to releasably couple the binding during use of the sliding board, the base assembly comprising: (i) a support disc configured to be removably coupled to the deck of the sliding board and to secure the base assembly to the sliding board; (ii) a deck plate rotatable about the support disc and configured to be positioned adjacent the deck; (iii) a bonnet also rotatable about the support disc and configured to receive and engage the binding, the bonnet operable with the deck plate to support one or more components of the base assembly; (iv) adjustment means for facilitating the rotational adjustment of the bonnet and the deck plate about the support disc and with respect to the sliding board, thereby facilitating a plurality of stance orientations of the boot assembly with respect to the sliding board, the adjustment means configured to selectively engage the support disc at any one of a plurality of adjustment positions; (v) coupling means configured to releasably couple the binding to the base assembly, and therefore the boot system to the sliding board, thereby securing a user thereto; and (vi) release means for actuating the coupling means to release the binding from the base assembly, and therefore the boot system from the sliding board.

The present invention also features a binding system for use on a sliding board comprising: (a) a binding operable with a boot assembly, the binding comprising a support surface and toe and heel pieces extending therefrom, the toe and heel pieces each having a receiver formed therein; (b) a base assembly configured to be rotatably and removably secured to a deck of a sliding board and to releasably couple and support the binding during use of the sliding board, the base assembly comprising: (i) a support disc configured to be removably coupled to the deck of the sliding board and to secure the base assembly to the sliding board; (ii) a deck plate rotatable about the support disc and configured to be positioned adjacent the deck; (iii) a bonnet also rotatable about the support disc and configured to receive and engage the binding, the bonnet operable with the deck plate to support one or more components of the base assembly; (iv) adjustment means for facilitating the rotational adjustment of the bonnet and the deck plate about the support disc, thereby facilitating a plurality of stance orientations of the boot assembly with respect to the sliding board, the adjustment means configured to selectively engage the support disc at any one of a plurality of adjustment positions; (v) release means for facilitating the selective manual release of the binding from the base assembly, and therefore the boot assembly from the sliding board; (vi) a toe plunger supported about a front portion of the bonnet and operable with the release means, the toe plunger being configured to releasably engage the receiver formed in the toe piece of the binding to secure the binding to the base assembly; and (vii) a heel plunger supported about a rear portion of the bonnet and operable with the release means, the heel plunger being configured to releasably engage the receiver formed in the heel piece of the binding.

The present invention further features a binding system for use on a sliding board comprising: (a) a binding operable with a boot assembly, the binding comprising a support surface and toe and heel pieces extending therefrom, the toe and heel pieces each having a receiver formed therein; (b) a base assembly configured to be rotatably and removably secured to a deck of a sliding board and to releasably couple and support the binding during use of the sliding board, the base assembly comprising: (i) a support disc configured to be removably coupled to the deck of the sliding board and

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to secure the base assembly to the sliding board; (ii) a deck plate rotatable about the support disc and configured to be positioned adjacent the deck; (iii) a bonnet also rotatable about the support disc and configured to receive and engage the binding, the bonnet operable with the deck plate to support one or more components of the base assembly; (iv) adjustment means for facilitating the rotational adjustment of the bonnet and the deck plate about the support disc, thereby facilitating a plurality of stance orientations of the boot assembly with respect to the sliding board, the adjustment means configured to selectively engage the support disc at any one of a plurality of adjustment positions; (v) release means for facilitating the selective manual release of the binding from the base assembly, and therefore the boot assembly from the sliding board; (vi) a toe plunger supported about a front portion of the bonnet and operable with the release means, the toe plunger being configured to releasably engage the receiver formed in the toe piece of the binding to secure the binding to the base assembly, the toe plunger comprising a plurality of pressure surfaces formed therein and configured to receive forces thereon as applied by the binding and to facilitate an optimal selective pre-set tension release of the binding from the base assembly, and therefore the boot assembly from the sliding board, at least one of an infinite number of release angles; and (vii) a heel plunger supported about a rear portion of the bonnet and operable with the release means, the heel plunger being configured to releasably engage the receiver formed in the heel piece of the binding, the heel plunger comprising a plurality of pressure surfaces formed therein and configured to receive forces thereon as applied by the binding and to facilitate an optimal selective pre-set tension release of the binding from the base assembly, and therefore the boot assembly from the sliding board, at least one of an infinite number of release angles, the toe and heel plungers being configured to secure the binding to the base assembly, and therefore the boot assembly to the sliding board.

In one exemplary embodiment, the support disc couples to the deck of a sliding board preferably using one of various standard hole patterns, such as a three or four-hole pattern, wherein the hole patterns are provided for in the support disc. The center disc functions to rotatably secure the base assembly to the sliding board.

Each of the rider's feet are held in place by a boot system operable with the binding. Each binding is configured to engage the base assembly by fitting the binding over the bonnet and causing the toe and heel plungers to engage the binding, thus securing it in place. In other words, the binding system allows the rider to "step-in" to the binding system simply by placing a foot into the boot assembly, positioning the binding over the base assembly, and applying a downward force to snap the binding in place down onto the base assembly, with the toe and heel plungers engaging and releasably coupling the binding. The base assembly further functions to provide a riser function to improve the performance of the sliding board.

Unlike prior related snowboard binding systems, the present invention binding system will release upon impact. This function is made possible by an adjustable tension release system that may be pre-set by the rider to meet desired specifications. The tension in the binding system is pre-set on at least one, and preferably both, of the toe and heel plungers using a separate spring and shaft system for each toe and heel plunger. The current release tension setting may be viewed through a window formed in the bonnet of the base assembly, which window is shaped and designed to cover the inner functioning mechanisms of the base assembly.

bly and to protect these from snow and ice, while still allowing the toe and heel plungers to extend outside the bonnet.

When the toe or heel plunger is subjected to forces or pressures exceeding the tension setting indicated by the rider, the binding system will release, thus allowing the binding to release from the base assembly, and, more importantly, the foot of the rider to release from the sliding board. This is accomplished by the toe and/or heel plungers pressing against a series of release levers, cams, spacers, and the spring and shaft assembly behind each toe or heel plunger. In other words, the release mechanism, or release means, is comprised of these several components that actuate with the shaft and spring assembly operable with each toe and heel plunger.

In addition, the toe and heel plungers comprise a specific design to facilitate an infinite number of release angles. This is accomplished by forming at least one, and preferably a plurality, of pressure surfaces in the toe and heel plungers. The pressure surfaces are formed on pressure angles, preferably between 35° and 40°. Providing infinite release angles allows the binding to release from the base assembly at any angle from the horizontal line upward.

The release means may further comprise a quick-release design. In one exemplary embodiment, the release means may comprise a release lever located or positioned about the side of the bonnet. The lever may comprise a handle or knob, wherein the user may grasp the handle and actuate the lever to actuate the spring assembly against the toe plunger in order to allow the user to disengage the binding.

The adjustment means may also comprise a quick-release design, wherein the adjustment means comprises a lever located or positioned on a side of the bonnet opposite from the quick-release release lever. The lever may be configured to releasably engage all or a portion of the support disc, thereby facilitating a plurality of different stance orientations as desired by the rider without requiring the unscrewing of any screws or other similar fasteners.

The present invention still further features a method for securing a rider to a sliding board.

The present invention further features a universal binding apparatus for detachably securing a footwear-type article to a second article, the apparatus comprising: (a) a first plate that can attach to either of the footwear-type and second articles, and that comprises: (i) a toe retaining latch, disposed at a front portion of the first plate, the toe retaining latch comprising a plurality of pressure surfaces formed therein to enable an optimal selective pre-set tension release at an infinite number of release angles; (ii) a heel retaining latch, disposed at a rear portion of the first plate, the heel retaining latch comprising a plurality of pressure surfaces formed therein to enable an optimal selective pre-set tension release at an infinite number of release angles; and (iii) a first release, disposed between the toe retaining latch and the heel retaining latch, to disengage at least one of the toe retaining latch or the heel retaining latch; (b) a second plate that can attach to the the article not secured to the first plate and that comprises: (i) a toe clip, disposed at a front portion of the second plate; and (ii) a heel clip, disposed at a rear portion of the second plate, wherein the second plate is detachably secured to the first plate with the toe clip engaged within the toe retaining latch and the heel clip engaged within the heel retaining latch and wherein the first release operates to movably disengage at least one of the toe retaining latch or the heel retaining latch from the second plate.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings merely depict exemplary embodiments of the present invention they are, therefore, not to be considered limiting of its scope. It will be readily appreciated that the components of the present invention, as generally described and illustrated in the figures herein, could be arranged and designed in a wide variety of different configurations. Nonetheless, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

FIG. 1 illustrates a perspective view of a snowboard having two base assemblies attached or coupled thereto according to one exemplary embodiment of the present invention, wherein the base assemblies are adjusted to comprise different stance orientations with respect to the snowboard;

FIG. 2 illustrates a perspective side view of a tension release binding system according to one exemplary embodiment of the present invention, wherein the tension release binding system comprises a binding assembly that releasably couples to a base assembly;

FIG. 3 illustrates a perspective view of a binding coupled to a base assembly, as well as a foot plate operably supported and coupled to a top or mounting surface of the binding;

FIG. 4 illustrates an exploded perspective view of the various component parts of the exemplary base assembly of the exemplary tension release binding system of FIG. 2;

FIG. 5 illustrates a top view of the exemplary base assembly of the exemplary tension release binding system of FIG. 2;

FIG. 6 illustrates perspective view of the exemplary base assembly of the exemplary tension release binding system of FIG. 2, wherein the support disc is partially cut-away to reveal the teeth formed in the locking lever that are configured to engage the corresponding teeth formed in the support disc to provide a plurality of adjustment positions within the binding system to vary the stance orientation with respect to the sliding board;

FIG. 7 illustrates a bottom view of the exemplary base assembly of the exemplary tension release binding system of FIG. 2, wherein various release components are depicted that are configured to facilitate both manual and tension release of the binding from the base assembly;

FIG. 8 illustrates a bottom view of the exemplary base assembly of the exemplary tension release binding system of FIG. 2, wherein the deck plate is attached to enclose and support the various components of the base assembly;

FIG. 9-A illustrates a perspective view of a heel plunger according to one exemplary embodiment of the present invention, wherein the heel plunger comprises a plurality of pressure surfaces, each with corresponding pressure angles, and is configured for use with the exemplary base assembly of FIG. 2;

FIG. 9-B illustrates a side view of the heel plunger of FIG. 9-A, wherein a longitudinal pressure surface and its corresponding pressure angle is depicted;

FIG. 9-C illustrates a top view of the heel plunger of FIG. 9-A, wherein opposing pressure surfaces and their corresponding pressure angles are depicted;

FIG. 10 illustrates a partially exploded perspective view of a universal binding apparatus, according to one exemplary embodiment of the present invention;

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FIG. 11 illustrates a perspective view of the inside mechanism utilized in the universal binding system of FIG. 10, wherein the toe and heel plates are positioned in an open or released position;

FIG. 12 illustrates a perspective view of the universal binding system of FIG. 11, wherein the toe and heel kick plates are positioned in a secured position;

FIG. 13 is a side plan view of the universal binding apparatus according of FIG. 11, wherein the first release is positioned in a full release position; and

FIG. 14 illustrates a side plan view of the universal binding apparatus of FIG. 13, wherein the first release is positioned in a latched position.

#### DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The following detailed description of exemplary embodiments of the invention makes reference to the accompanying drawings, which form a part hereof and in which are shown, by way of illustration, exemplary embodiments in which the invention may be practiced. While these exemplary embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, it should be understood that other embodiments may be realized and that various changes to the invention may be made without departing from the spirit and scope of the present invention. Thus, the following more detailed description of the embodiments of the present invention, as represented in FIGS. 1 through 14, is not intended to limit the scope of the invention, as claimed, but is presented for purposes of illustration only and not limitation to describe the features and characteristics of the present invention, to set forth the best mode of operation of the invention, and to sufficiently enable one skilled in the art to practice the invention. Accordingly, the scope of the present invention is to be defined solely by the appended claims.

The following detailed description and exemplary embodiments of the invention will be best understood by reference to the accompanying drawings, wherein the elements and features of the invention are designated by numerals throughout.

For purposes of clarification, the phrase "sliding board," as referred to herein, shall be understood to mean any type of board or board-like device, as commonly known, for use in a sliding sport, wherein the board or board-like device utilizes a binding assembly or binding system to secure the board to the feet or foot of a user. Examples of sliding boards include, but are not limited to snow and water skis, snowboards, wakeboards, and others as known in the art.

The phrase "sliding sport," as referred to herein, shall be understood to mean any type of sport or recreational activity in which a sliding board is required or recommended for participation. Examples of sliding sports include, but are not limited to, water and snow skiing, snowboarding, wakeboarding, and others as known in the art.

The phrase "pressure surface," as referred to herein, shall be understood to mean one or more surfaces formed on one or more of the components of the binding system that are specifically designed to receive and bear a force or load thereon as applied by the binding for the purpose of supporting the binding about the base assembly and securing thereto, and for facilitating the triggering of a tension release of the binding from the base assembly in the event the tension setting is exceeded.

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The phrase "pressure angle," as referred to herein, shall be understood to mean the angle at which a pressure surface is configured.

The phrase "release angle," as used herein, shall be understood to mean the angle at which the binding releases from the base assembly upon a tension release.

The phrase "tension release," as referred to herein, shall be understood to mean the triggered release of the binding from the base assembly in response to a load on the pressure angle exceeding the pre-set or pre-determined tension setting, wherein the load may be induced from an impact or excessively applied tension.

The phrase "tension setting" or "pre-set tension setting," as referred to herein, shall be understood to mean the pre-set adjustment in the binding system set by the user to define the maximum acceptable forces or loads that may be placed on the pressure surfaces of the load bearing components of the binding system. This may be alternatively defined as the tension threshold.

The present invention describes a method and system for securing a user or rider to a sliding board via a multi-function binding system.

The present invention provides several significant advantages over prior related binding systems, some of which are recited here and throughout the following more detailed description. First, the binding system incorporates a user adjustable tension release capability that allows the binding to release from the base assembly in response to an impact or other excessive force. This is significantly advantageous when the binding system is used on a snowboard as prior related binding systems are deficient in this area. Moreover, the tension release feature improves the safety to the rider by allowing the feet to release if subjected to abnormal loads. Second, the binding system provides a quick-release, wherein the user can easily manually actuate the release system to release the binding from the base assembly. Third, the binding system provides an adjustment means allowing riders, such as snowboarders, skiers, and the like, to easily adjust the stance orientation of each binding, and therefore each foot, with respect to the sliding board, without having to unscrew screws or other fasteners as is required in most prior related binding systems. The adjustment means is preferably actuated by a quick-release mechanism, similar to the quick-release for the release system. Fourth, the binding system utilizes specifically designed coupling means in the form of plungers or latches, described herein as heel and toe plungers or latches, to effectuate tension release at an infinite number of release angles. Each toe and heel plunger comprises pressure surfaces, both lateral and longitudinal, that provide for lateral and vertical release, as well as various combinations of these. The pressure surfaces are formed at specific angles to provide pressure angles configured to optimize the release of the binding from the base assembly. More specifically, these pressure angles function to provide an optimal counter resistance on the binding before it suddenly releases from the base assembly. The pressure angles are specifically configured to be between 35 and 40 degrees. This range of degrees has been established as that enabling the most optimal release. Fifth, the binding system allows the rider to "step-in" to the binding system by securing the binding to his or her foot, positioning the binding over the base assembly, and causing the binding to engage and couple to the base assembly by causing the toe and heel pieces to engage the corresponding receivers in the binding. Sixth, the base assembly provides a riser function allowing the rider to gain leverage and height, thus reducing or eliminating heel and/or toe drag, two problems common

with prior related binding systems. Seventh, the base assembly is designed to be interchangeable, meaning it may be applied or used on different types of sliding boards, thus allowing the binding to couple to different types of sliding boards. The binding system utilizes standard hole mounting configurations, such as three-hole and four-hole configurations. The interchangeability feature allows the rider to use a single binding, or at least a single style of binding, on each of the different sliding boards. This may be especially advantageous to those just learning to use one or more sliding boards as it increases the familiarity and any relatedness between boards.

Each of the above-recited advantages, as well as any others presented herein, will be apparent in light of the detailed description set forth below, with reference to the accompanying drawings. These advantages are not meant to be limiting in any way. Indeed, one skilled in the art will appreciate that other advantages may be realized, other than those specifically recited herein, upon practicing the present invention.

With reference to FIG. 1, illustrated is a perspective view of a sliding board utilizing an exemplary embodiment of a binding system of the present invention. Specifically, FIG. 1 illustrates a sliding board 2 in the form of a snowboard. The snowboard comprises an upper surface or deck 4 on which front and rear base assemblies are mounted, shown as front base assembly 60-a and rear base assembly 60-b. Each of the base assemblies 60-a and 60-b are configured to receive a binding (not shown), and therefore a respective foot of a user or rider (the term "rider" and "user" are used interchangeably throughout).

As can be seen, each base assembly 60-a and 60-b is removably mounted to the deck 4 via a center support disc, shown as support discs 64-a and 64-b, respectively. The center support disc 64 functions to rotatably secure or mount each base assembly 60-a and 60-b to the deck 4 of the sliding board 2. As shown, each base assembly 60-a and 60-b may be adjusted to comprise any desired stance orientation as referenced from a longitudinal axis 6 of the sliding board 2. The adjustability of the base assemblies is discussed in more detail below. Nonetheless, it is noted that the support discs 64-a and 64-b, although removably mounted to the deck 4 of the sliding board 2, are not configured to rotate. Rather these are mounted in a fixed position with the various other components of each base assembly configured to rotate or otherwise adjust about the support disc 64.

With reference to FIG. 2, illustrated is a side perspective view of the present invention binding system according to one exemplary embodiment, wherein the binding component of the binding assembly is depicted in an elevated position above the base assembly. As shown, the binding system 10 comprises a base assembly 60 configured to be removably mounted to a deck of a sliding board as described above. Once mounted, the base assembly 60 is configured to receive a binding assembly 14 comprising a boot assembly 18 and a binding 30. The boot assembly 18 is configured to receive and secure a foot of a user, and comprises a boot configuration operable with one or more fastening configurations, such as those known in the art. The boot assembly 18 is configured to couple to the binding 30, wherein the binding 30 functions with the boot assembly 18 to support the foot of the user about the base assembly 60 and sliding board (see FIG. 1).

In the exemplary embodiment shown, the binding 30 comprises a primary support plate 32 having an upper surface (not shown) for receiving and supporting a foot of a user, or a foot plate (see foot plate 28 in FIG. 3), and a lower

surface 36, which is configured to be positioned adjacent and rest against the upper surface 128 of the bonnet 120 and the upper plate 68 of the support disc 64, each of the base assembly 60, when the binding 30 is releasably coupled thereto.

The binding 30 also comprises a boot mount 56 configured to receive and secure or support a boot assembly 18. In the exemplary embodiment shown, the boot mount 56 comprises front and rear portions 57 and 58 located on opposing sides of the primary support plate 32 and extending upward therefrom. The front and rear portions each comprise one or more mounting holes 59 configured to receive a fastener therein of any suitable type known in the art and to facilitate the mounting of the boot assembly 18 to the binding 30. The boot mount 56 further functions to provide or assist in the lateral support of a foot of a user as contained in the boot secured to the user's foot. The particular size and geometric configuration of the boot mount 56 is not intended to be limited to that shown in FIG. 2.

The binding 30 further comprises a toe support or toe piece 40 located at a front portion of and extending from the primary support plate 32. The toe piece 40 comprises a geometric configuration that matches that of a front portion or front surface 156 of the bonnet 120 of the base assembly 60. More specifically, the toe piece 40 is configured with an inside surface 42 and an outer surface 43, wherein the inside surface 42 is designed and configured to engage the outer front surface 156 of the bonnet 120, with the front surface 156 of the bonnet 120 providing support to the toe piece 40 and the binding 30. The toe piece 40 further comprises a receiver 44 formed in its inside surface 42. The receiver 44 is sized and configured to receive or engage and releasably secure a toe plunger 280 of the base assembly 60, thus releasably coupling the binding 30 to the base assembly 60. The toe plunger 280 comprises a pre-set tension setting, wherein it provides a counter force acting against the binding 30. Therefore, the receiver 44 comprises a similar geometric configuration as the portion of the toe plunger 280 being inserted therein.

Similarly, the binding 30 further comprises a heel support or heel piece 46 located at a rear portion of and extending from the primary support plate 32. The heel piece 46 comprises a geometric configuration that matches that of a rear portion or rear surface 164 of the bonnet 120 of the base assembly 60. More specifically, the heel piece 46 is configured with an inside surface 47 and an outer surface 48, wherein the inside surface 47 is designed and configured to engage the outer rear surface 164 of the bonnet 120, with the rear surface 164 of the bonnet 120 providing support to the heel piece 46 and the binding 30. The heel piece 46 further comprises a receiver 50 formed in its inside surface 47. The receiver 50 is sized and configured to receive or engage and releasably secure a heel plunger 310 of the base assembly 60, thus releasably coupling the binding 30 to the base assembly 60. The heel plunger 310, like the toe plunger 280, comprises a pre-set tension setting, wherein it provides a counter force acting against the binding 30. Therefore, the receiver 50 comprises a similar geometric configuration as the portion of the heel plunger 310 being inserted therein. Due to their configuration, the toe and heel pieces or supports 40 and 46 function as coupling means to provide both lateral and longitudinal support for the binding 30 about the base assembly 60.

It is noted herein that the terms "toe plunger" and "heel plunger" are used herein for distinguishing and explanatory purposes only. These two structures are identical in all respects. The base assembly of the binding system does not

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comprise designated front and rear portions, but can be oriented so that either end may comprise the front or rear. Stated differently, the front of the binding may be attached to the base assembly with the base assembly facing in either direction.

The binding 30 further comprises front and rear slots 45 and 49, respectively, that are designed to facilitate the attachment of a foot plate to the upper surface of the binding 30 as discussed below and shown in FIG. 3. In addition, the binding 30 comprises lateral slots 52 and 54 located on opposing sides of the binding 30 that permit the binding 30 to couple to the base assembly 60 without interrupting the displacement or actuation of the adjustment and release mechanisms 210 and 240, or any of their component parts, respectively, of the base assembly 60. The lateral slots 52 and 54 are defined by edges of the toe and heel pieces 40 and 46, respectively, as well as an edge of the lower surface 36 of the primary support plate 32.

FIG. 2 also illustrates the base assembly 60 in an assembled state. The base assembly 60 comprises, in part, a support disc 64 that is preferably centrally located within the base assembly 60, although not required. The support disc 64 comprises an upper plate 68 having a perimeter 72, and a lower body portion (not shown, but see lower body portion 76 in FIG. 4). The support disc 64 is designed and configured to be removably fixed to a deck of a sliding board (not shown in FIG. 2, but see deck 4 and sliding board 2 in FIG. 1). As such, the support disc 64 comprises one or more mounting hole configurations. In the exemplary embodiment shown, the support disc 64 comprises both a three-hole mounting configuration 92 and a four-hole mounting configuration 96, each of which are standard in the art and each of which may be used depending upon the type of sliding board the binding system 10 is to be used with.

The support disc 64 is further designed and configured to be rotatably supported within the base assembly 60. More accurately, the base assembly 60 is designed to be rotatable about the support disc 64 since the support disc is removably fixed to the deck of the slidable board. The components of the base assembly 60 rotate about the support disc 64 to enable the base assembly 60, and therefore the binding coupled thereto and the rider secured within the binding, to achieve a plurality of different stance orientations.

FIG. 2 illustrates the base assembly 60 as further comprising a bonnet 120 configured to house the various internal components and mechanisms of the base assembly 60. As shown, the bonnet 120 comprises an upper top support plate 124 having an upper surface 128 and a lower surface (not shown). The upper surface 128 is substantially flat and designed and configured to receive and support thereon the substantially flat lower surface 36 of the binding 30 as coupled to the base assembly 60. In essence, the bonnet 120 functions as a riser for the binding 30, thus increasing the height and leverage of the binding system, which helps to reduce or eliminate toe or heel drag. Formed in the top support plate 124 of the bonnet 120 is an aperture (not shown in FIG. 2, but see aperture 136 in FIG. 4) sized and configured to receive the support disc 64 therein, as well as to rotatably support the support disc 64, thus facilitating adjustment of the base assembly 60 about the support disc 64 to enable the binding system 10 to achieve different stance orientations. The support disc 64 comprises a lip (not shown, but see lip 84 in FIG. 4) that engages a ledge (also not shown, but see ledge 148 in FIG. 4) to secure the bonnet to the sliding board.

As indicated above, the bonnet 120 further comprises front and rear surfaces 156 and 164 designed to receive and

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support thereon the matching toe and heel pieces 40 and 46, respectively, of the binding 30. The front surface 156 has formed therein a slot 160 configured to enable the toe plunger 280 to extend outward from the interior of the base assembly 60 past the front surface 156 of the bonnet 120, and to displace bi-directionally back and forth therein. Likewise, the rear surface 164 has formed therein a slot 168 that is configured to enable the heel plunger 310 to extend outward from the interior of the base assembly 60 past the rear surface 164 of the bonnet 120, and to displace bi-directionally back and forth therein.

The bonnet 120 further comprises a first side (not shown, but see first side 188 in FIGS. 4 and 5) and a second side 192, each extending downward from the top support plate 124. As shown, the second side 192 comprises a lateral slot 200 formed therein to allow displacement and actuation of the adjustment mechanism 210, and particularly the locking lever 214 of the adjustment mechanism 210, as intended. The first side also comprises a similar lateral slot (see first side 188 and lateral slot 196 in FIGS. 4 and 5) formed therein that is sized and configured to allow displacement and actuation of the release mechanism 240, and particularly the release lever 244, as intended.

The bonnet 120 further comprises therein a first window 172 configured to provide a view to the dog 428 functioning as an indicator of the pre-set tension setting corresponding to the load placed on the heel plunger 310 by the release mechanism 240. The window 172 comprises an aperture formed in the support plate 124. The bonnet 120 further comprises a second window 176 configured to provide a view to the dog 448 functioning as an indicator of the pre-set tension setting corresponding to the load placed on the toe plunger 280 by the release mechanism 240.

FIG. 2 further illustrates the deck plate 100 located beneath and enclosing the bonnet 120. As discussed herein, the deck plate 100 is designed and configured to be adjacent and rest against the deck of a sliding board.

With reference to FIG. 3, illustrated is a perspective view of the exemplary binding system 10 shown in FIG. 2, wherein the exemplary binding 30 and the exemplary base assembly 60 are shown in a coupled configuration. FIG. 3 further illustrates a foot plate 28 operably supported and coupled to the upper mounting surface 34 of the primary support plate 32 of the binding 30. The foot plate 28 functions to increase the surface area of the binding 30 to better accommodate a foot of a user either with a boot (e.g., in the case of snowboarding) or without a boot (e.g., in the case of wakeboarding). The foot plate 28 may comprise any size and shape, and may comprise one or more contours corresponding to the foot of a user, if appropriate. The foot plate 28 may be optional and selectively removed. Although FIG. 3 illustrates the foot plate 28 as comprising a separate structure, the foot plate 28 may be integrally formed with the binding 30.

With reference to FIGS. 2 and 4-8 illustrated are various views of the exemplary base assembly 60 of the exemplary binding system 10. As can be seen, the base assembly 60 comprises a support disc 64 having an upper plate 68, a perimeter 72 of the upper plate 68, and a lower body portion 76 extending from the upper plate 68, as shown. The lower body portion 76 comprises a sidewall 80 configured to receive one or more components in the adjustment mechanism to selectively position the base assembly 60 in any one of a plurality of available stance orientations. As shown, the sidewall 80 comprises a plurality of teeth 88 formed therein configured to define the plurality of available stance orientations. Furthermore, the upper plate 68 and the lower body

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portion 76 form a lip 84 at their intersection. The lip 84 is configured to engage a corresponding ledge 148 formed in the bonnet 120, thereby securing the bonnet 120 and the various components to the sliding board. Thus, the bonnet 120 and the entire base assembly 60 may only be removed from the sliding board upon removal of the support disc 64. The lip 84 and corresponding ledge 148 are further configured to rotate about one another, thus facilitating the rotation of the bonnet 120 with respect to the support disc 64 in the event the stance orientation of the base assembly 60 is adjusted. The support disc further comprises hole mounting patterns shown as three-hole mounting pattern 92 and four-hole mounting pattern 96.

The support disc 64 is inserted into the apertures 136 and 112 formed in the bonnet 120 and the deck plate 100, respectively, until coming to rest upon the deck of the sliding board, wherein it is then coupled to the sliding board. The deck plate 100 comprises an upper surface 104 and a lower surface 108, and is configured to function as a support member for many of the components and mechanisms in the base assembly 60, as well as to encase these. The deck plate 100 has several mounting holes 116 formed therein to facilitate the mounting of various base assembly components, such as the adjustment mechanism 210 and the release mechanism 240.

The adjustment mechanism 210 comprises a biased locking lever 214 that is rotatably or pivotally coupled about a pivot point 226. The locking lever 214 further comprises a handle or knob 218 designed to provide an ergonomic interface with the user in actuating the adjustment mechanism 210. In the embodiment shown, the adjustment mechanism 210 comprises a series or a rack of teeth 222 formed in the locking lever 214 that are configured to engage the corresponding teeth 88 formed in the support disc 64. A spring 230 functions to bias the locking lever 214, and the rack of teeth 88, towards an engaged position against the support disc 64. The bonnet 120 comprises a sidewall 144 defining the aperture 136. Within the sidewall 144 is a slot 152 configured to provide an opening through which a portion of the locking lever 214 supporting the rack of teeth 222 may pass to engage the support disc 64.

With the adjustment mechanism 210 in an engaged position, the bonnet 120 and the components contained therein are prohibited from rotating about the support disc 64. To adjust the stance orientation of the base assembly 60 relative to the sliding board, the user simply actuates the adjustment mechanism 210 by grasping the handle 218 and displacing the locking lever 214 to overcome the counter force applied by the spring 230. Upon displacement, the rack of teeth 88 on the locking lever 214 disengage from the teeth 222 on the support disc 64, thereby enabling the bonnet 120 to rotate about the support disc 60. The base assembly 60 may therefore be positioned in any number of adjustment positions resulting in different stance orientations. Indeed, by providing teeth 222 that span entire sidewall 80 of the support disc 64, such as in the embodiment shown, any stance orientation within a 360° rotation may be achieved. The adjustment mechanism 210 is further configured as a quick-release system, wherein a user may vary the stance orientation quickly and easily at any time without having to release the binding.

Other types of adjustment mechanisms are contemplated herein, although these are not specifically described. For example, the lower portion of the support disc may comprise a smooth sidewall. The adjustment mechanism may comprise some type of clamp that clamps to the sidewall in an infinite number of adjustment positions and resulting stance

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orientations. In still another embodiment, the sidewall may comprise a plurality of apertures formed therein that are configured to receive a corresponding peg or insert formed on the locking lever of the adjustment mechanism to achieve specific adjustment positions and resulting stance orientations.

The release mechanism 240 comprises a release lever 244 having a cam portion 246 formed therein, wherein the release lever 244 is rotatably or pivotally coupled about a pivot point. The release lever 244 further comprises a handle or knob 248 designed to provide an ergonomic interface with the user in manually actuating the release mechanism 240. In the embodiment shown, the release mechanism 240 comprises a first plunger lever 412 operable with the toe plunger 280 and a second plunger lever 416 operable with the heel plunger 310. Each of the first and second plunger levers 412 and 416 are double acting levers configured to provide compounded motion.

The first and second plunger levers 412 and 416 each comprise along one edge a curved surface that engages and interacts with the linear ledge of the respective toe and heel plungers during actuation of the release mechanism. Along the opposite edges of the first and second plunger levers 412 and 416 is a surface comprising the same shape as that of the inside surfaces 42 and 47 of the toe and heel supports 40 and 46, respectively (see FIG. 1), thus allowing the first and second plunger levers 412 and 416 to nest therein when the release mechanism is configured to position the toe and heel plungers in a fully extended position (this configuration is depicted in FIG. 7). The second plunger lever 416 is pivotally coupled to the bonnet 120 at one end.

The release mechanism further comprises a release cam 252 rotatable about the same pivot point as the release lever 244. The release cam 252 comprises a cam portion contained within a cam track 414 formed in the first plunger lever 412. Upon displacement of the release lever 244 and subsequent actuation of the release mechanism, the release cam 252 is caused to rotate, wherein its cam portion tracks along the cam track 414. This action functions to displace the first plunger lever 412 to effectuate the retraction of the toe plunger 280, thereby allowing the binding to release from the base assembly. The toe and heel plungers 280 and 310 are coupled to the first and second plunger levers 412 and 416, respectively, via respective nubs protruding therefrom. The nubs are located within a corresponding non-concentric aperture formed in the first and second plunger levers 412 and 416, thus providing a limited degree of slip between the plunger levers and the plungers.

The adjustment mechanism further provides for tension release, wherein the binding will release from the base assembly upon exceeding a pre-set tension setting set by the user. As shown, shaft 420 is contained within a slot 134 formed in the bottom surface of the bonnet 120. The shaft 420 supports a shaft journal 424, a dog 428, a spring 432, and a button 436, each configured to operate together to force the plunger lever 416 against the inside surface of the heel support 46. The shaft is threaded and the spring is supported against a shoulder. Any forces acting to exceed the pre-set tension setting will function to trigger the adjustment mechanism to release the binding from the base assembly. More specifically, any forces acting to exceed the pre-set tension setting will cause the button 436 to displace and compress the spring 432, which retracts the heel plunger 310 and releases the binding from the base assembly. The same tension release feature is provided for the toe plunger 280, wherein the shaft 440, the shaft journal 444, the dog 448, and

the button 456 function together with the first plunger lever to provide tension release of the binding from the base assembly.

As indicated, the adjustment mechanism 240 enables a user to adjust the pre-set tension setting. In the exemplary embodiment shown, the adjustment mechanism 240 comprises a gearing system configured to facilitate the rotation of the shaft and the changing of the tension setting. When the gearing system is turned, the shaft rotates to move the dog 428 upward or downward, which changes the compression in the spring, thus varying the tension setting. The dog 428 is visible through the window formed in the bonnet 120 to indicate the pre-set tension setting.

The base assembly 60 further comprises various spacers, such as rear spacer 400, front spacer 404, and gap spacer 408 to facilitate proper operation of the various mechanisms supported by the base assembly 60.

With reference to FIGS. 9-A-9-C, illustrated are various views of a heel plunger according to one exemplary embodiment of the present invention, wherein the heel plunger comprises a plurality of pressure surfaces, each with corresponding pressure angles, and is configured for use within the exemplary base assembly of FIG. 2. Specifically, as shown, the heel plunger 310 comprises an upper surface 314, a lower surface 318 and a riser 322 extending from the upper surface 314 to form a ledge 326. The riser 322 itself comprises an upper surface 330 and a front surface 334. The riser 322 further comprises several pressure surfaces, shown as first longitudinal pressure surface 338, second longitudinal pressure surface 340, first lateral pressure surface 344 and second lateral pressure surface 348, each with their own corresponding pressure angles.

FIG. 9-B illustrates first and second longitudinal pressure surfaces 338 and 340. The first longitudinal pressure surface 338 comprises a pressure angle  $\beta_1$ . The second longitudinal pressure surface 340 comprises a pressure angle  $\beta_2$ . Likewise, FIG. 9-C illustrates first and second lateral pressure surfaces 344 and 348. The first lateral pressure surface 344 comprises a pressure angle  $\beta_1$ . The second lateral pressure surface 348 comprises a pressure angle  $\beta_2$ .

The pressure surfaces are specifically configured to comprise pressure angles between 35 and 40 degrees, which is the angle determined to provide optimal tension release of the binding from the base assembly. More specifically, these angles function to provide an optimal counter resistance on the binding before it suddenly releases from the base assembly. In addition, the pressure surfaces are configured to enable the binding to release at an infinite number of release angles since there are no toggle mechanisms present unlike those found in prior related binding systems.

Steeper pressure angles, such as those below 35° (e.g., 30°) are inadequate because they cam out. Thus, steeper angles will not result in adequate release of the binding. More gradual angles, such as those above 40° (e.g., 45°), leaves the binding too loose and does not adequately support the binding and the rider about the base assembly and the sliding board. Providing angles between 35 and 40 degrees allows the optimal pressures to be reached and not exceeded prior to release of the binding. Indeed, the binding must be able to support some pressures and forces to keep the binding and the boot, and therefore the rider, on the sliding board without releasing. However, by supporting too much pressure or force, the binding will not release, thus potentially injuring the rider. Thus a balance must be struck between acceptable pressures for use and those where the binding should release.

In the heel toe 310 shown, the three pressure surfaces and resulting pressure angles function in a similar manner as the three toggles in prior related bindings. However, rather than requiring three separate mechanisms to achieve the three pressure angles, each pressure angle is included in a single mechanism, the heel plunger 310. Thus, the present invention features a single mechanism configured with vertical and lateral pressure angles that facilitate release from the binding in the vertical direction, as well as the two lateral directions.

As can be seen, the surface area on the longitudinal pressure surfaces of the plunger, or those configured for vertical heel tension release, is much greater than the surface area on the lateral pressure surfaces, or those configured to provide lateral heel tension release. This is because the foot can withstand a greater amount of force or pressure in the vertical heel/toe direction than it can in the lateral direction from lateral shear forces. Thus, the forces required for vertical release can be increased to keep the binding from releasing. To accommodate these forces, the longitudinal pressure surface comprises a greater surface area. The opposite is true for the lateral sides of the plunger and the lateral release angles. These do not need to accommodate as great of forces since the foot cannot handle shear forces as well. Thus, the lateral sides of the binding are configured with smaller release angles having smaller surface areas.

Of course, other configurations of the heel plunger are contemplated herein, such as one without a riser. Indeed, the pressure surfaces and the corresponding pressure angles may be incorporated into any number of different plunger configuration. It is specifically noted herein that the heel and toe latches discussed below also comprise both longitudinal and lateral pressure surfaces and corresponding pressure angles.

The present invention further features a universal ski binding apparatus, which is illustrated in FIGS. 10-14. The universal binding apparatus 610 is illustrated for use with a flat or alpine ski 612, which has attached to it a releasable base binding or plate 614 that secures a boot or footwear 616 to ski 612 via a second securing or top plate 618.

The universal ski binding 610 makes both snowboard and ski bindings releasable. It serves as an interface that fits between a snowboard and a snowboard binding or a ski and a ski binding, respectively, to allow them to release the rider from the board at a preset pressure on impact. Further, the rider can perform a quick release via a quick release lever that has been heretofore lacking in the prior art. This enables a reduction in injuries and an increased safety level and performance in both snowboarding and skiing. Further, it provides vertical lift for added carving leverage and lessened toe and hill drag in the snow and fatigue to the rider commonly associated with prior binding systems. The release mechanism is also able to release at all required angles via the novel design interaction of the release surfaces of the mounting plate and the securing top plate. Importantly, the universal snowboard and ski binding provides multiple angles of release, which offers greater safety than the limited angles of release on current ski and snowboard bindings.

Base plate 614 further includes a toe kick latch 620 and a heel kick latch 622 that both slide forward or backward relative to the orientation of ski 612 in order to secure top plate 618 within base plate 614. A first release lever 624 serves to disengage toe kick latch 620 while a second release lever 626 serves to disengage heel kick latch 622. Top plate 618 engages the base plate 614 via a first or toe support 628 and a second or heel support 630, respectively. Both toe kick latch 620 and heel kick latch 622 are spring loaded so that

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when a sufficient force is applied to top plate **618**, such as when a skier falls, the toe kick latch **620** or heel kick latch **622** will travel a sufficient enough distance to release its respective toe support **628** or heel support **630**. This releases the top plate and frees the skier from possible bodily injury or property damage. As indicated above, each of the toe and heel latches comprise pressure surfaces and corresponding pressure angles similar to those discussed above, which discussion is incorporated herein. The pressure surfaces are specifically configured to comprise pressure angles between 35 and 40 degrees, thus optimizing the tension release of the top plate.

Additionally, with the platform provided by the binding system **610**, snowboarders and skiers can eliminate the need for risers or "gas pedals" normally used to reduce toe and heel drag. For example, in skiing, traditional bindings place the ski boot right on the surface of the ski, which can lead to drag as the skier cuts sharply for a turn. Risers have been used to elevate the ski boot above the top surface of the ski, thereby reducing or eliminating drag. These risers are no longer necessary when the binding apparatus **610** is utilized instead.

The tension for the springs that control the force on toe latch **620** and heel latch **622** is adjustable via an adjusting screw **632** and **634**, respectively. Each screw **632** and **634** may be turned with either an Allen wrench or a screwdriver, such as a flat head or a Phillips, so that proper tension desired by the user can be quickly achieved. To protect the spring and latching mechanism, a cover plate **636** is firmly secured atop the base plate **614** and is supported by cover support tabs **637**. Cover support tabs **637** are integrated within base plate **614**.

FIGS. **11** and **12** illustrate first a release position (FIG. **11**) and then a secure position (FIG. **12**). It is noted that the kick latches **620** and **622** move in opposite directions along the same line of engagement in order to secure top plate **618**. Each kick latch **620** and **622**, as previously stated, is held within a fixed position by release levers **624** and **626**, respectively. First release lever **624** causes toe kick latch **620** to release and disengage the top plate **618** when lifted upwardly. Second release lever **626** operates in the same manner for releasing heel kick latch **622**. Release levers **624** and **626** allow the rider conveniently to release him self while in deep powder or in any other situation. A lanyard or cord can be attached to either release lever **624** or **626** so that the rider can pull on the cord from a distance in order to release the rider from the board.

Once one of the kick plates has been released either in a fall or by one of the release lever **624** or **626**, the rider can then reengage the kick latch **620** or **622** by simply kicking them in the retaining position towards the main body of the bottom plate **614**. This feature allows the rider to reengage the bindings without needing to bend over or sit down in the snow, which then allows the rider to step back into the binding apparatus without difficulty. Kick latches **620** and **622** slide back so that release levers **624** and **626** are held in place via release notches **625** and **627**, respectively, as shown in FIGS. **4** and **5**. FIG. **4** illustrates the position of toe kick latch **620** in the released position while FIG. **5** illustrates the kick latches **620** and **622** engaging the top plate **618**.

Each kick latch **620** and **622** further includes a recess **621**, which is utilized to retain or hold toe support **628** or heel support **630** in place when kick latches **620** and **622** are moved to their latch position.

Toe kick latch **620** is actually part of a kick plate **638** as shown in FIGS. **2** and **3**. Kick plate **638** is held in place

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within base plate **614** via a pair of set screws **644**, which allow kick plate **638** to slide between a first and second position. Likewise, heel kick latch **622** is part of a kick plate **639**, which can slide freely, but is held in place via set screws **646**. Set screws **646** are identical to set screws **644**. Each kick plate **638** and **639** is designed to be identical in configuration, which simplifies production, assembly and replacement or repair work.

The base plate **614** further includes several sets of springs, which are used to provide tension and force for holding the latches **620** and **622** in position and enable them to release under desired conditions. A first set of springs includes springs **640** and **642**. Springs **640** and **642** serve to bias the kick plates **620** and **622**, respectively, opposite one another. The large set of springs **640** and **642** control the release tension as well. The next set of springs **645** and **647** are placed within spring retainers **649** and **651**, respectively. Springs **645** and **647** serve to control the lateral pressure on the release levers **624** and **626**. The last set of springs **650** ride in shallow cavities etched into the under surface of cover **636**. Springs **650** support the base plate cover **636** and urge the release lever **624** and **626** in place, below notches **625** and **627**, respectively, once the latches **620** and **622** are moved into their retention orientation.

Each main spring **640** and **642** is held in position by a binding release tension shaft **643**, which allows the spring to be compressed for a given tension as well as secures the release lever **624** and **626** in combination with the kick latches **620** and **622**, respectively. A cam **648** is also moveably secured on binding release tension shaft **643** and operates with the release plate to adjust the release tension of either kick plate **638** or kick plate **639** when they are engaged with the release levers **624** or **626**. As the tension adjustment screw **632** or **634** is turned, the cam **648** is retained within notches formed in part of the release levers **624** and **626** such that the spring force is increased or decreased, depending on how the screws are turned. Binding release tension shaft **643** can have either right handed or left handed threads. Retention tabs **653** are formed under each of kick latch **620** and **622** and which engage plate **614** while engaging the top plate **618**. Retention tabs **653** engage notches **672**, shown in FIG. **11**.

Cover plate **636** has a useful shape that allows it to rest against the top plate surfaces to eliminate problems with release consistency that are typically caused by floating or "relative," tension between the heel and toe releases. Cover plate **636** is prevented from traveling against top plate **618**; otherwise, the top plate would float on the cover. Cover plate **636**, therefore, serves as a cover retention and release surface. The universal binding system **610** is designed to work well with very narrow skis and the release plates are modified to be utilized with a conventional ski. A rider can then use the same universal binding system on any other board that they may use which allows them to use the same boots with either the skis or the snowboard. The system is also able to work with most soft bindings and boots as a firm exoskeleton, shown in FIG. **610**, can be adapted to include a top plate **618** for binding with bottom plate **614**.

The foregoing detailed description describes the invention with reference to specific exemplary embodiments. However, it will be appreciated that various modifications and changes can be made without departing from the scope of the present invention as set forth in the appended claims. The detailed description and accompanying drawings are to be regarded as merely illustrative, rather than as restrictive, and

all such modifications or changes, if any, are intended to fall within the scope of the present invention as described and set forth herein.

More specifically, while illustrative exemplary embodiments of the invention have been described herein, the present invention is not limited to these embodiments, but includes any and all embodiments having modifications, omissions, combinations (e.g., of aspects across various embodiments), adaptations and/or alterations as would be appreciated by those in the art based on the foregoing detailed description. The limitations in the claims are to be interpreted broadly based on the language employed in the claims and not limited to examples described in the foregoing detailed description or during the prosecution of the application, which examples are to be construed as non-exclusive. For example, in the present disclosure, the term “preferably” is non-exclusive where it is intended to mean “preferably, but not limited to.” Any steps recited in any method or process claims may be executed in any order and are not limited to the order presented in the claims. Means-plus-function or step-plus-function limitations will only be employed where for a specific claim limitation all of the following conditions are present in that limitation: a) “means for” or “step for” is expressly recited; b) a corresponding function is expressly recited; and c) structure, material or acts that support that structure are expressly recited. Accordingly, the scope of the invention should be determined solely by the appended claims and their legal equivalents, rather than by the descriptions and examples given above.

What is claimed and desired to be secured by Letters Patent is:

1. A binding system configured for use on a sliding board comprising:

- a binding operable with a boot assembly, said binding comprising a support surface and toe and heel pieces extending therefrom;
- a base assembly configured to be rotatably and removably secured to a deck of a sliding board and to releasably couple said binding during use of said sliding board, said base assembly comprising:
  - a support disc configured to be removably coupled to said deck of said sliding board and to secure said base assembly to said sliding board;
  - a deck plate rotatable about said support disc and configured to be positioned adjacent said deck;
  - a bonnet also rotatable about said support disc and configured to receive and engage said binding, said bonnet operable with said deck plate to support one or more components of said base assembly;
  - an adjustment mechanism configured to facilitate the rotational adjustment of said bonnet and said deck plate about said support disc and with respect to said sliding board, thereby facilitating a plurality of stance orientations of said boot assembly with respect to said sliding board, said adjustment mechanism configured to selectively engage said support disc at any one of a plurality of adjustment positions;
  - coupling means configured to releasably couple said binding to said base assembly, and therefore said boot system to said sliding board, thereby securing a user thereto; and
  - a release mechanism configured to actuate said coupling means to release said binding from said base assembly, and therefore said boot system from said sliding board.

2. The binding system of claim 1, wherein said coupling means comprises:

- a toe plunger supported about a front portion of said bonnet and operable with said release mechanism, said toe plunger being configured to releasably engage a receiver formed in said toe piece of said binding; and
- a heel plunger supported about a rear portion of said bonnet and operable with said release mechanism, said heel plunger being configured to releasably engage a receiver formed in said heel piece of said binding.

3. The binding system of claim 2, wherein said release mechanism functions to simultaneously actuate said toe and heel plungers to release said binding from said base assembly.

4. The binding system of claim 2, wherein said toe and heel plungers are biased and comprise a variable pre-set tension setting.

5. The binding system of claim 2, wherein said toe plunger comprises at least one pressure surface formed therein and configured to receive a force thereon as applied by said binding and to facilitate an optimal selective pre-set tension release of said binding from said base assembly at at least one of an infinite number of release angles.

6. The binding system of claim 5, wherein said pressure surface is formed at a pressure angle.

7. The binding system of claim 6, wherein said pressure angle is configured to be between 35° and 40°.

8. The binding system of claim 2, wherein said heel plunger comprises at least one pressure surface formed therein and configured to receive a force thereon as applied by said binding and to facilitate an optimal pre-set tension release of said binding from said base assembly at at least one of an infinite number of release angles.

9. The binding system of claim 8, wherein said pressure surface is formed at a pressure angle.

10. The binding system of claim 9, wherein said pressure angle is configured to be between 35° and 40°.

11. The binding system of claim 1, wherein said support disc comprises an aperture coupling arrangement selected from the group consisting of a standard three-hole coupling arrangement and a standard four-hole coupling arrangement.

12. The binding system of claim 1, wherein said base assembly, and therefore said binding system, is interchangeable and configured for use on different types of sliding boards.

13. The binding system of claim 1, wherein said bonnet provides a raised mounting surface to support said binding that functions to increase leverage and height for said user, as well as to reduce potential heel and toe drag.

14. The binding system of claim 1, wherein said binding functions to release from said base assembly upon said binding exerting a force and resulting pressure on said coupling means that exceeds a threshold pre-set tension release.

15. The binding system of claim 1, further comprising a foot plate operable with said binding and configured to provide support to a foot of a user.

16. A binding system for use on a sliding board comprising:

- a binding operable with a boot assembly, said binding comprising a support surface and toe and heel pieces extending therefrom, said toe and heel pieces each having a receiver formed therein;

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a base assembly configured to be rotatably and removably secured to a deck of a sliding board and to releasably couple and support said binding during use of said sliding board, said base assembly comprising:

- a support disc configured to be removably coupled to said deck of said sliding board and to secure said base assembly to said sliding board;
- a deck plate rotatable about said support disc and configured to be positioned adjacent said deck;
- a bonnet also rotatable about said support disc and configured to receive and engage said binding, said bonnet operable with said deck plate to support one or more components of said base assembly;
- an adjustment mechanism configured to facilitate the rotational adjustment of said bonnet and said deck plate about said support disc, thereby facilitating a plurality of stance orientations of said boot assembly with respect to said sliding board, said adjustment mechanism configured to selectively engage said support disc at any one of a plurality of adjustment positions;
- a release mechanism configured to facilitate the selective manual release of said binding from said base assembly, and therefore said boot assembly from said sliding board;
- a toe plunger supported about a front portion of said bonnet and operable with said release mechanism, said toe plunger being configured to releasably engage said receiver formed in said toe piece of said binding to secure said binding to said base assembly; and
- a heel plunger supported about a rear portion of said bonnet and operable with said release mechanism, said heel plunger being configured to releasably engage said receiver formed in said heel piece of said binding.

17. The binding system of claim 16, wherein said toe and heel plungers each comprise a plurality of pressure surfaces formed therein and configured to receive forces thereon as applied by said binding and to facilitate an optimal selective pre-set tension release of said binding from said base assembly at at least one of an infinite number of release angles.

18. The binding system of claim 17, wherein said pressure surfaces are formed on respective pressure angles.

19. The binding system of claim 18, wherein said pressure angles are configured to be between 35° and 40°.

20. A binding system for use on a sliding board comprising:

- a binding operable with a boot assembly, said binding comprising a support surface and toe and heel pieces extending therefrom, said toe and heel pieces each having a receiver formed therein;
- a base assembly configured to be rotatably and removably secured to a deck of a sliding board and to releasably couple and support said binding during use of said sliding board, said base assembly comprising:
  - a support disc configured to be removably coupled to said deck of said sliding board and to secure said base assembly to said sliding board;
  - a deck plate rotatable about said support disc and configured to be positioned adjacent said deck;
  - a bonnet also rotatable about said support disc and configured to receive and engage said binding, said bonnet operable with said deck plate to support one or more components of said base assembly;

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an adjustment mechanism configured to facilitate the rotational adjustment of said bonnet and said deck plate about said support disc, thereby facilitating a plurality of stance orientations of said boot assembly with respect to said sliding board, said adjustment mechanism configured to selectively engage said support disc at any one of a plurality of adjustment positions;

a release mechanism configured to facilitate the selective manual release of said binding from said base assembly, and therefore said boot assembly from said sliding board;

a toe plunger supported about a front portion of said bonnet and operable with said release mechanism, said toe plunger being configured to releasably engage said receiver formed in said toe piece of said binding to secure said binding to said base assembly, said toe plunger comprising a plurality of pressure surfaces formed therein and configured to receive forces thereon as applied by said binding and to facilitate an optimal selective pre-set tension release of said binding from said base assembly, and therefore said boot assembly from said sliding board, at at least one of an infinite number of release angles; and

a heel plunger supported about a rear portion of said bonnet and operable with said release mechanism, said heel plunger being configured to releasably engage said receiver formed in said heel piece of said binding, said heel plunger comprising a plurality of pressure surfaces formed therein and configured to receive forces thereon as applied by said binding and to facilitate an optimal selective pre-set tension release of said binding from said base assembly, and therefore said boot assembly from said sliding board, at at least one of an infinite number of release angles, said toe and heel plungers being configured to secure said binding to said base assembly, and therefore said boot assembly to said sliding board.

21. The binding system of claim 20, wherein said pressure surfaces are formed on respective pressure angles.

22. The binding system of claim 21, wherein said pressure angles are configured to be between 35° and 40°.

23. A universal binding apparatus for detachably securing a footwear-type article to a second article, the apparatus comprising:

- a first plate that can attach to either of said footwear-type and second articles, and that comprises:
- a toe retaining latch, disposed at a front portion of said first plate, said toe retaining latch comprising a plurality of pressure surfaces formed therein to enable an optimal selective pre-set tension release at an infinite number of release angles;
- a heel retaining latch, disposed at a rear portion of said first plate, said heel retaining latch comprising a plurality of pressure surfaces formed therein to enable an optimal selective pre-set tension release at an infinite number of release angles; and
- a first release, disposed between said toe retaining latch and said heel retaining latch, to disengage at least one of said toe retaining latch or said heel retaining latch;
- a second plate that can attach to the said article not secured to said first plate and that comprises:
  - a toe clip, disposed at a front portion of said second plate; and
  - a heel clip, disposed at a rear portion of said second plate, wherein said second plate is detachably secured to said

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first plate with said toe clip engaged within said toe retaining latch and said heel clip engaged within said heel retaining latch and wherein said first release operates to movably disengage at least one of said toe retaining latch or the heel retaining latch from said second plate. 5

**24.** The universal binding apparatus of claim **23**, wherein said toe retaining latch comprises a longitudinal pressure angle and two opposing lateral pressure angles.

**25.** The universal binding apparatus of claim **23**, wherein said pressure angles are formed at angles between 35° and 40°. 10

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**26.** The universal binding apparatus of claim **23**, wherein said toe and heel clips comprise angles formed therein that correspond to said pressure angles of said toe and heel latches, respectively.

**27.** The universal binding apparatus of claim **23**, wherein said first plate functions to release from said second plate in the event at least one of said toe and heel clips exert a force and resulting pressure on said pressure angles of said respective toe and heel latches that exceeds a threshold pre-set tension release.

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